

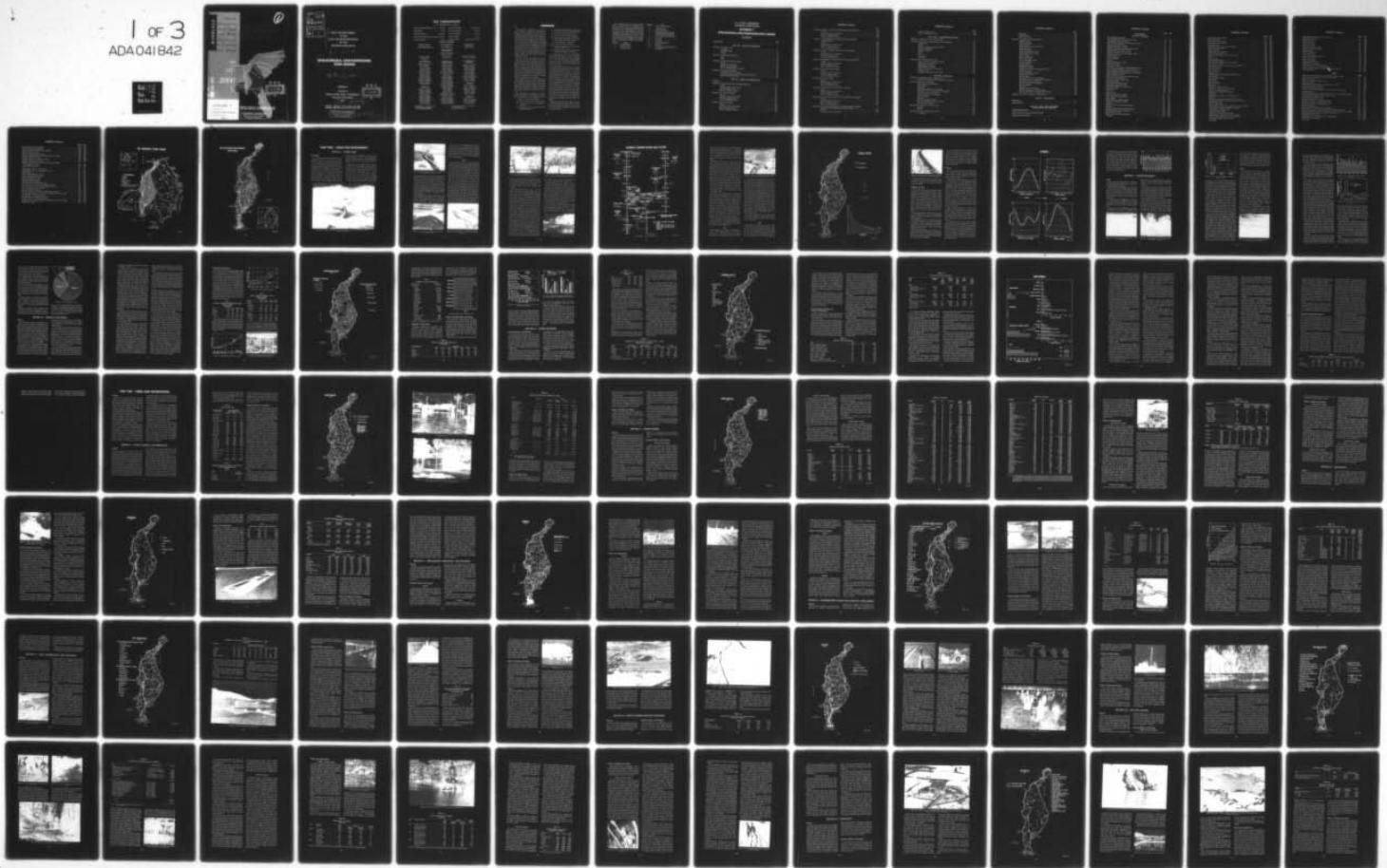
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PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOU--ETC(U)
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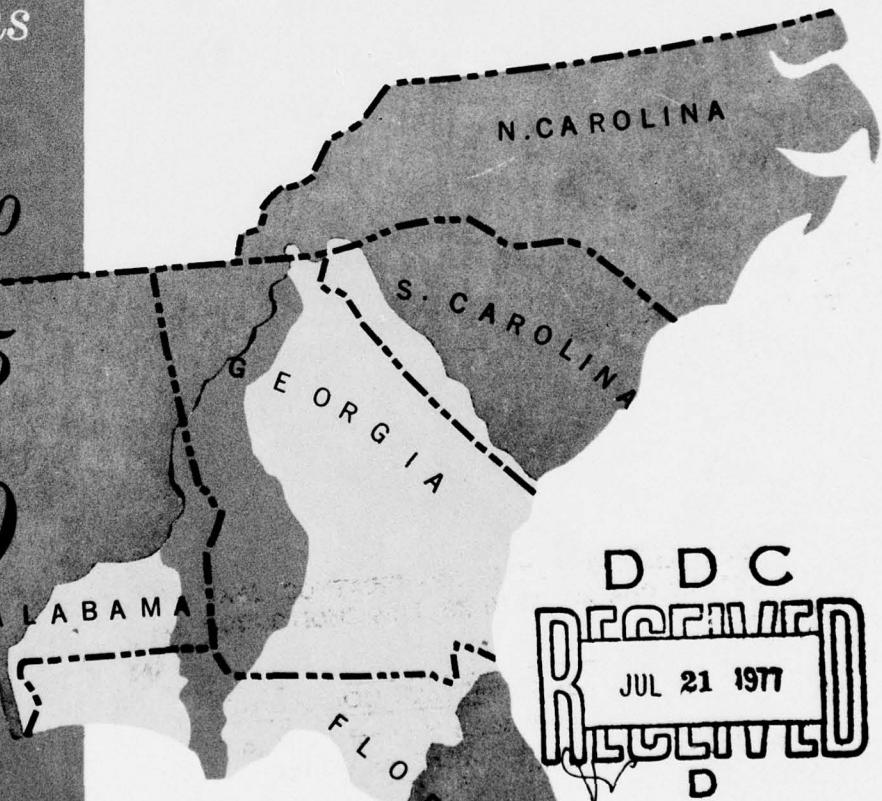
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**APALACHICOLA
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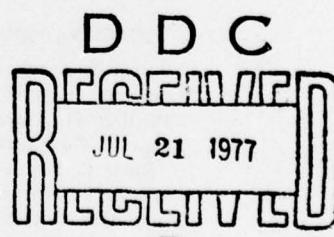
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FOREWORD

This Appendix summarizes the results of studies made in formulating a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Apalachicola-Chattahoochee-Flint basins. The plan for the basins is a part of the comprehensive plan for the development of the land and water resources of the Southeast River Basins.

Data relevant to the development of the land and water resources of the Apalachicola-Chattahoochee-Flint basins are summarized in six interrelated parts. The matter contained in each part is pertinent to the comprehensive plan. The reader is urged to consider the Report in the aggregate rather than to consider selected material out of context.

Part One includes a description of the area, a discussion of its resources, and a presentation of the present and future population and economy. Part Two presents the level of needs by purpose. Part Three describes planning procedures as applied to this study. Part Four presents the comprehensive plan, including a separate listing of improvements warranting early action, for the Apalachicola-Chattahoochee-Flint basins; Part Five contains the conclusions; and Part Six acknowledges the assistance of public and private agencies and individuals.

The Report of the United States Study Commission summarizing the plan for the Southeast River Basins is made in response to the provisions of Public Law 85-850 (72 Stat. 1090) dated August 28, 1958, which established the United States Study Commission, Southeast River Basins. Public Law 85-850 is reproduced in Appendix 13.

The authorizing Act provides for an integrated and cooperative investigation to formulate a comprehensive and coordinated plan for:

- (1) Flood control and prevention;
- (2) domestic and municipal water supplies;
- (3) the improvement and safeguarding of navigation;
- (4) the reclamation and irrigation of land, including drainage;

- (5) possibilities of hydroelectric power and industrial development and utilization;
- (6) soil conservation and utilization;
- (7) forest conservation and utilization;
- (8) preservation, protection, and enhancement of fish and wildlife resources;
- (9) the development of recreation;
- (10) salinity and sediment control;
- (11) pollution abatement and the protection of public health; and
- (12) other beneficial and useful purposes not specifically enumerated in the Act.

The comprehensive plan for the Southeast River Basins is formulated to meet the needs of the area for land and water resources development to the year 2000. Projects and programs existing and under construction in 1960 are included in the plan, but only 1960-2000 developments are analyzed.

The plan for the development of the resources of the Southeast River Basins and the Apalachicola-Chattahoochee-Flint basins is the result of cooperative work of Federal, State, and local and private agencies having interest in the area and knowledge of its needs and requirements. Public hearings were held early in the planning process to obtain firsthand knowledge of conditions and problems in the study area and to secure suggestions for their solution. Throughout the study, liaison was maintained with interested groups and agencies by means of conferences and committee and advisory group meetings. When a tentative plan was developed, public presentations were made by the Commission to inform interested persons and organizations and to request comments. These comments were considered in preparing the final plan and Report.

Although many individuals, groups, and agencies have participated in the studies, the Commission takes full responsibility for the plan and for the projections, assumptions, and analyses on which it is based.

The Commission plan for the Southeast River Basins is supported by data contained in 13 appendixes. Data on the plan for development of the resources in the eight geographic areas studied in the Southeast River Basins are contained in Appendixes 1 through 8. Technical data and information applicable to both the entire study area and the several geographic areas are contained in Appendixes 9 through 13. The appendixes to the Commission Report are as follows:

Appendix	Title
1	Savannah Basin
2	Ogeechee Basin
3	Altamaha Basin

Appendix	Title
4	Satilla-St. Marys Basins
5	Suwannee Basin
6	Ochlockonee Basin
7	APALACHICOLA-CHATTA-HOCHEE-FLINT BASINS
8	Choctawhatchee-Perdido Basins
9	Economics
10	Hydrology
11	Engineering and Cost
12	Planning
13	History and Organization of the Commission

U. S. STUDY COMMISSION
SOUTHEAST RIVER BASINS

APPENDIX 7

APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS

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THE SOUTHEAST RIVER BASINS

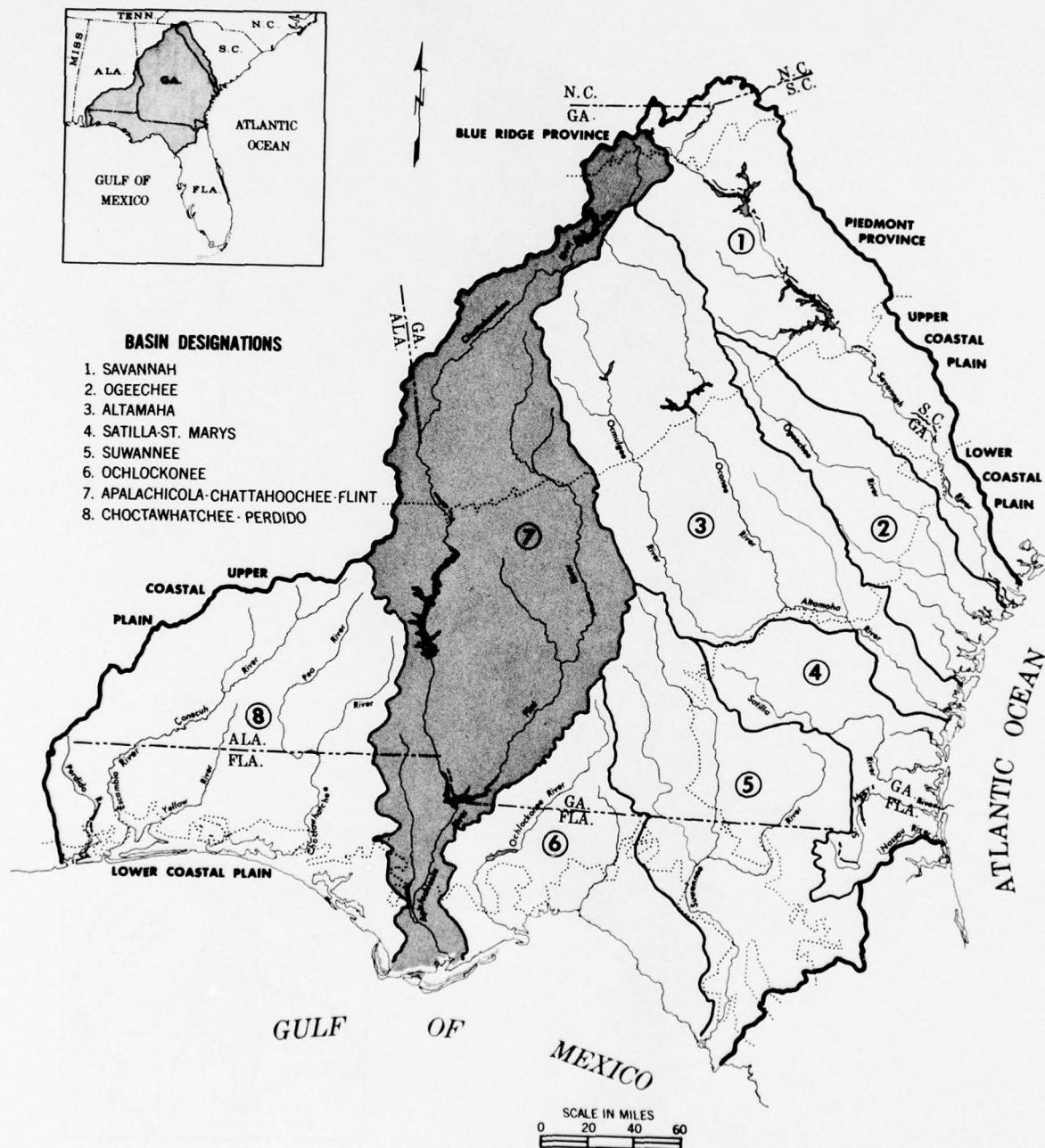


Figure 1.1

THE APALACHICOLA-CHATTahooCHEE- FLINT BASINS

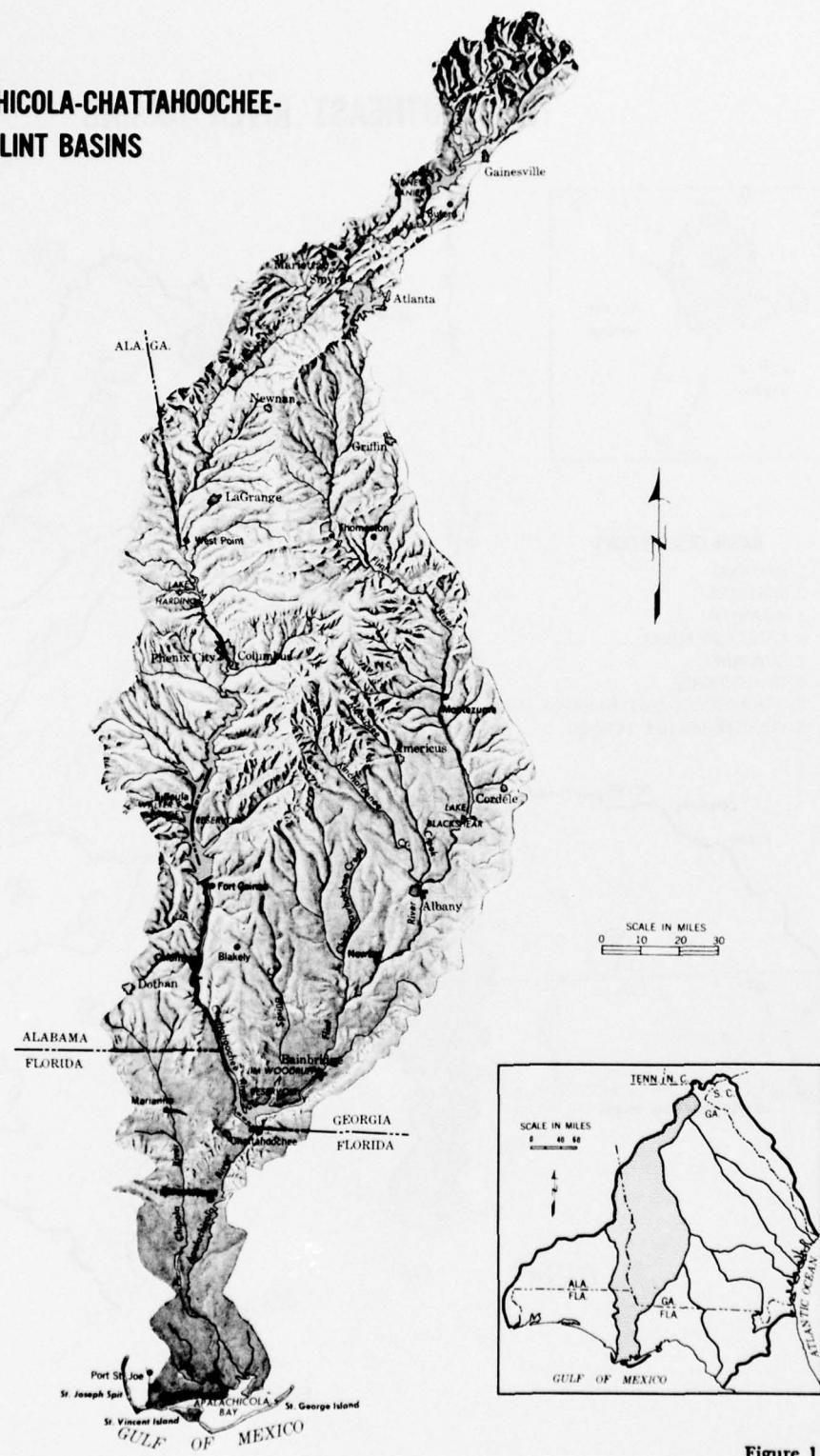


Figure 1.2

PART ONE - STAGE FOR DEVELOPMENT

SECTION I - BASINS AREA

Description

The Apalachicola-Chattahoochee-Flint basins, sometimes referred to as the A-C-F in this Report, are located in north and western Georgia, eastern Alabama, and northwestern Florida. The basins form the largest and longest segment of the Southeast River Basins. The area totals about 19,800 square miles of which 14,500 are in Georgia, 2,800 are in Alabama, and 2,500 are in Florida. The land area of the basins, including small water bodies, is 19,516 square miles, or about 12,490,000 acres. The length of the basins from the extreme headwaters to the Gulf of Mexico totals about 380 airline miles. The maximum width is about 110 miles. There are 59

Georgia counties, 10 Alabama counties, and 8 Florida counties wholly or partly within the basins. The basins drain parts of the Blue Ridge, Piedmont, and Coastal Plain physiographic provinces.

Elevations of about 4,000 feet above mean sea level occur in the Blue Ridge Mountains in the northern reaches of the watershed. These are rugged, densely wooded mountains with conspicuous relief and well-defined narrow valleys. Massive rock occasionally protrudes from the weathered soils. The red hills of the Piedmont province range from about 1,200 feet elevation near the mountains to about 600 feet at the Fall Line where the Piedmont province merges with



Figure 1.3 *Chattahoochee River Headwaters, Blue Ridge Mountains of Georgia. Many Mountain Valleys Are Cultivated.*



Figure 1.4 *The Chattahoochee River in the Piedmont Province—Historical Cotton Country.*

the Upper Coastal Plain. Here the valleys and slopes are steep because of the sharp descent of the streams and rivers through the Fall Line, which was at one time the shore of the ocean.

From the Fall Line, the Upper Coastal Plain extends southerly some 170 miles and covers about 62 percent of the entire area. This is a region of rolling plains with well-drained sandy soils and many diversified farms. The smaller streams flow in low-banked, tree-choked, meandering channels.

The Lower Coastal Plain is nearly flat with many wetlands and marshes. The streams and rivers of this region have wide flood plains. Much of the land is covered with pine forests

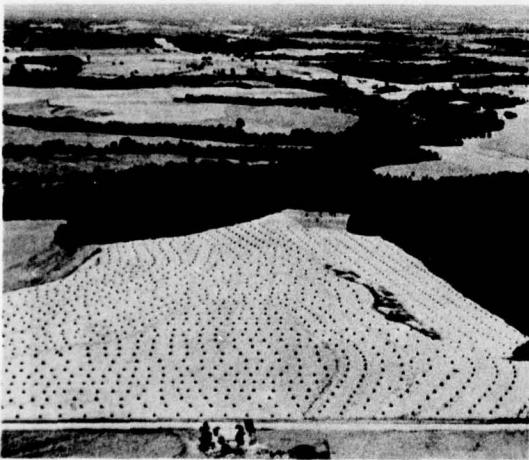


Figure 1.5 *Large and Small Diversified Farms Are Typical of the Coastal Plain.*

and swamps and is sometimes called the flatwoods. The land bordering the Gulf of Mexico is low and comparatively flat. The mainland is sheltered by a narrow island barrier. St. Vincent and St. George Islands, 4 to 10 miles offshore, shield the waters of Apalachicola Bay. St. Joseph Spit, on the west shore of the area, almost encloses St. Joseph Bay.

Rivers

The Apalachicola River, which is the main stem of the river system, lies wholly within the Coastal Plain and is formed by the confluence of the Flint and Chattahoochee Rivers in the southwest part of Georgia. The Apalachicola River is 113 miles long and is 600 to 800 feet wide in some areas. The upper and lower reaches are generally wider than the middle reach. Ordinary low-water surface elevation at the head of the river is 45 feet above mean sea level. For 90 miles from its headwaters, the river slopes at a fairly uniform rate of slightly less than 0.5 foot per mile. Maximum slope amounts to 0.7 foot per river mile. Gulf tides at its mouth have a mean range of 1.6 feet and affect the river about 25 miles. Jim Woodruff Dam is located on the Apalachicola River just below the confluence of the Chattahoochee and Flint Rivers. The average regulated low-water flow at Chattahoochee, Florida, near the head of the river, is about 15,500 cubic feet per second. The maximum flow of record is 293,000 cubic feet per second recorded in March 1929. Periodic dredging is re-

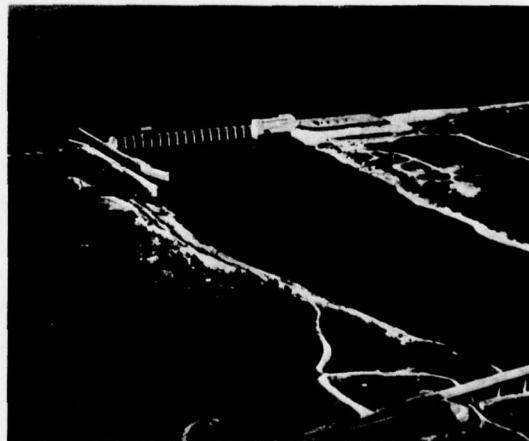


Figure 1.6 *Jim Woodruff Lock and Dam on the Apalachicola River Were the First Structures in the Basin's Navigation System.*

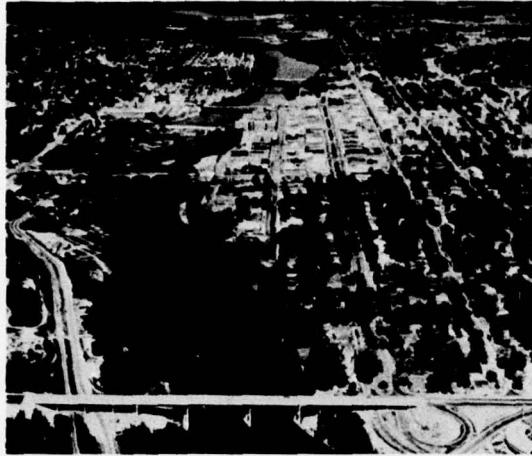


Figure 1.7 Phenix City, Alabama, and Columbus, Georgia, Are Sister Cities on the Chattahoochee River.

quired to maintain a 9-foot depth for navigation in the upper reaches. Dense hardwood swamps occupy the 10-mile-broad flood plain. The river has long straight reaches and wide bends; but navigation around some bends is difficult with long tows.

The Chattahoochee River rises in the Blue Ridge Mountains of north Georgia near the western tip of North Carolina and drains 8,770 square miles. The maximum width of its basin is 55 miles. The river is 436 miles long. Below West Point, Georgia, mile 198, the west bank becomes the boundary between Georgia and Alabama. In the 26 miles from the southeast corner of Alabama to the mouth of the river, mid-channel is the boundary between Georgia and Florida. The upper reaches of the river and its headwater tributaries are characterized by the steep slopes of mountain streams, but below mile 397 the slope is fairly uniform and averages 2.6 feet per mile to West Point. From West Point to Columbus, Georgia, mile 160, the river falls 368 feet, or 10 feet per mile. From Columbus to the mouth the river falls 145 feet at a rate of about 0.9 foot per mile. Part of this reach of the river is controlled for navigation and other uses by Jim Woodruff Dam, and the balance will be controlled when Walter F. George and Columbia Locks and Dams are completed in 1963. The maximum flood of record on the Chattahoochee at Columbia, Alabama, was 203,000 cubic feet a second and occurred in March 1929. During major floods, damage occurs at Columbus and



Figure 1.8 Albany, Georgia, on the Flint River, Is Another of the Basins Expanding Metropolitan Areas.

West Point, Georgia, and in low-lying parts of the valley immediately below those cities.

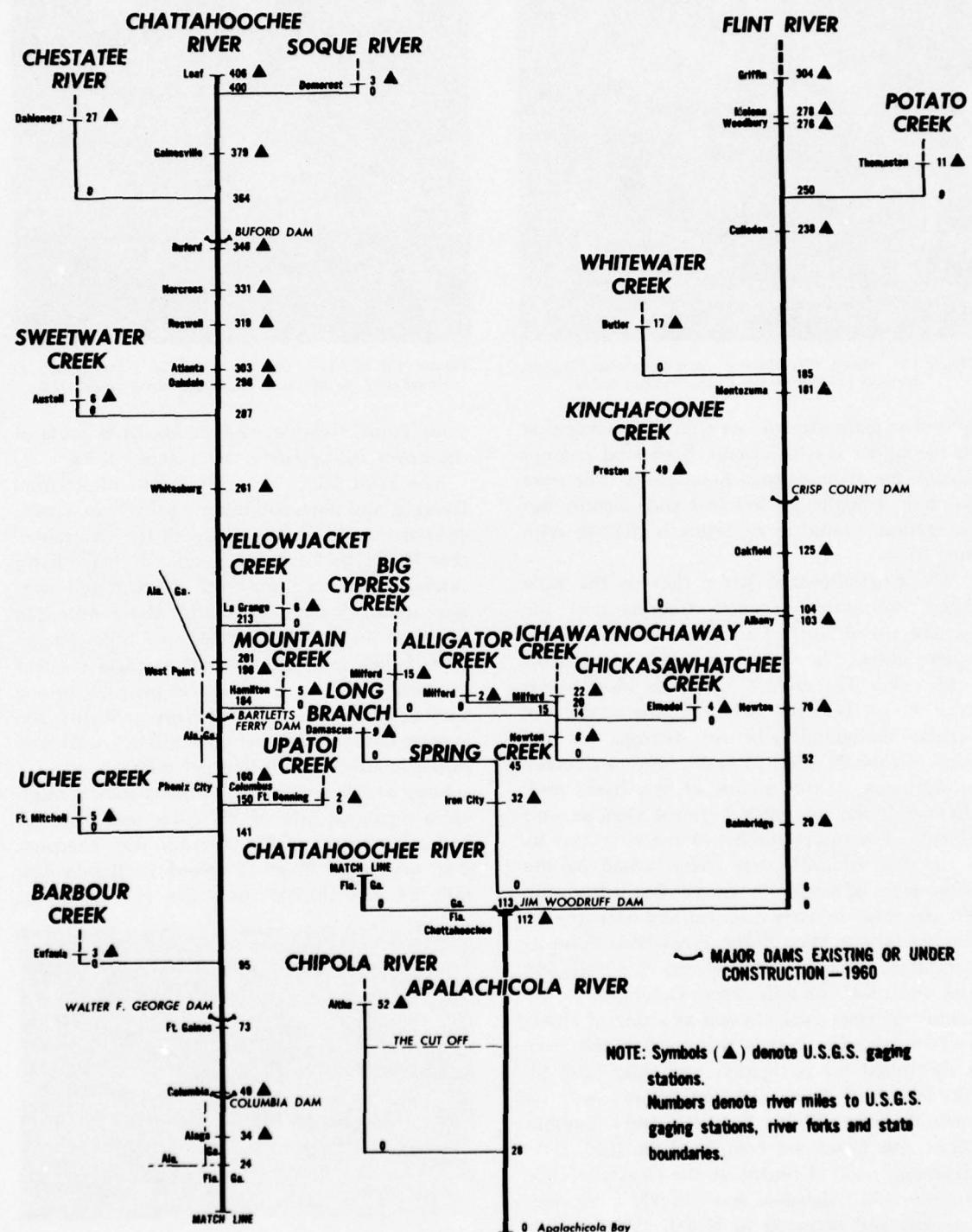
The Flint River rises just south of Atlanta, Georgia, and flows 350 miles southerly in a wide eastward arc to its junction with the Chattahoochee River. Its 8,460-square mile drainage basin extends 215 miles from north to south and averages about 40 miles in width. Above mile 285 the river slope averages 2 feet per mile. For 55 miles below mile 285 the fall averages 6.7 feet per mile and as much as 48 feet per mile in one section. From mile 230 to Albany, mile 103, the average fall is 1.3 feet per mile and below Albany to the mouth it is 1.0 foot per mile.

Stage and flow records at Albany show a minimum regulated flow of 327 cubic feet a second and a maximum of 92,000 cubic feet a second. The maximum flood of record at Bainbridge, mile 29, was 101,000 cubic feet per second in



Figure 1.9 Chipola River near Chason, Florida. Fish Abound in the Stream.

SCHEMATIC DIAGRAM BASINS RIVER SYSTEM



Schematic Diagram of the Basins River System.

Figure 1.10

January 1925. From Albany to Bainbridge, high banks generally confine the river to a 200-foot-wide channel through gently rolling arable land. Albany is considered the head of navigation, but for many years boats have gone only a few miles above Bainbridge. Hydroelectric power is developed at two plants on the main river above Albany.

The Chipola River rises in southeastern Alabama and flows southerly to empty into the Apalachicola River 28 miles above its mouth. Subterranean streams emerge north of Marianna, Florida, to contribute to its flows. It also flows underground for a short distance near Marianna. The average slope is 1.5 feet per mile from the headwaters to 25 miles below Marianna. An appreciable part of the fall is concentrated at a point known as Look and Tremble Shoals. Thence to Dead Lake, the slope is 0.4 foot per mile. At Dead Lake, the Cut-Off, a short channel, connects the Chipola River with the Apalachicola River at mile 44. Minimum flow measured about 20 miles below Marianna was 356 cubic feet per second. The maximum flood of record was 25,000 cubic feet per second and occurred in September 1926.

The Gulf Intracoastal Waterway joins the Apalachicola River through its west bank 6 miles above its mouth. This inland waterway extends from Apalachicola westward via Panama City and Pensacola, Florida; Mobile, Alabama; and New Orleans, Louisiana, to Brownsville, Texas, a distance of 1,030 miles. It follows the lower 6 miles of the Apalachicola to its mouth and extends thence eastward via Carrabelle to St. Marks, Florida, a distance of 83 miles. The Carrabelle-St. Marks section has been authorized by Congress but not constructed. A canal, with dimensions of 9 by 100 feet, connects Port St. Joe, Florida, with the Intracoastal Waterway at a point 18 miles west of the Apalachicola River.

The municipal water systems in the metropolitan Atlanta area and at Griffin and Thomaston, Georgia, divert a portion of the flow from the basins to the Altamaha basin.

Lakes

Lake Sidney Lanier, formed by Buford Dam on the Chattahoochee River, has an area of 38,000 acres and a usable capacity including flood storage of 1,686,000 acre-feet. The Walter

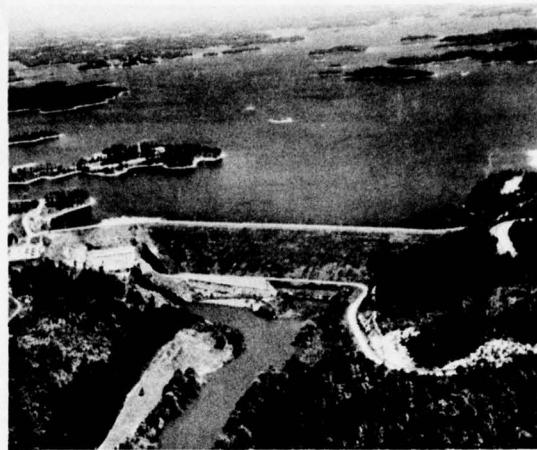


Figure 1.11 *Lake Sidney Lanier, Impounded by Buford Dam, Is the Upper Basins Largest Water Body.*

F. George Dam and Reservoir on the Chattahoochee River below Columbus has an area of 45,000 acres and a usable storage of 210,000 acre-feet. Jim Woodruff Reservoir, or Lake Seminole, formed by Jim Woodruff Dam on the Apalachicola River, has an area of 37,500 acres and a usable capacity of 385,000 acre-feet. These lakes are the largest storage developments in the basins. Some storage is provided by eight reservoirs on the Chattahoochee River between West Point and Columbus, Georgia. Lake Harding, with a usable capacity of 134,000 acre-feet, is the only one of the eight that has any appreciable storage. Small amounts of storage are provided by Morgan Falls, a regulation project on the Chattahoochee River near Atlanta; by two small hydroelectric plants on the Flint River; by two on the Soque River in the extreme upper part of the basins; and by one on Whitewater Creek near Montezuma, Georgia.

Few natural ponds occur in the Blue Ridge and Piedmont provinces. Many limestone sinks occur in the southwest Georgia and the Florida parts of the basins.

Coast

About 60 miles of coastline are exposed to the Gulf of Mexico, and many more miles of sheltered shore border the estuaries and Apalachicola Bay. Excellent sand beaches front the islands and spits. The sheltered shore is generally tidal marsh. Developments are beginning to dot the area and are expected to grow as the demand for

GENERAL GEOLOGY

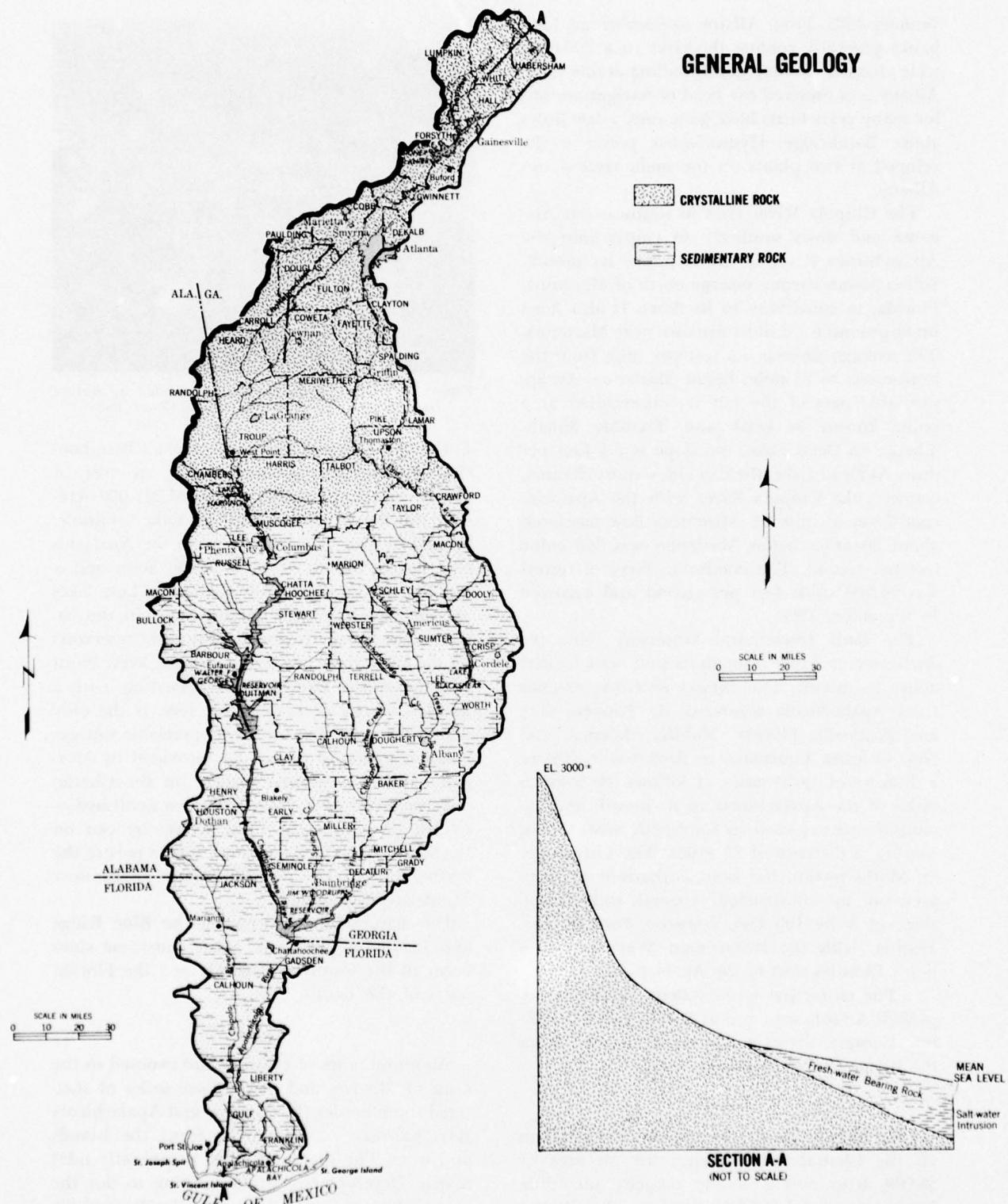


Figure 1.12

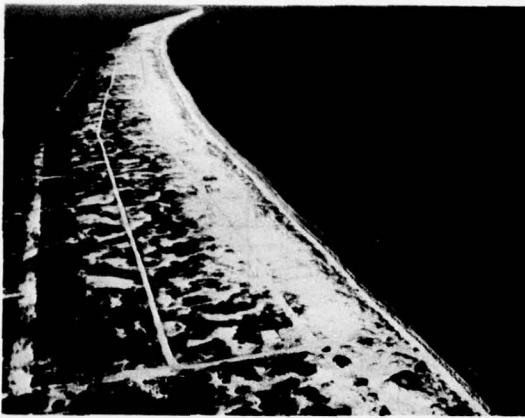


Figure 1.13 St. George Island, Separating the Gulf of Mexico and Apalachicola Bay, Has Excellent Beaches.

coastal homesites and recreation areas continues to increase. The many creeks, inlets, bays, coves, and points along the coast provide excellent waters for fishing.

Geology and Soils

The surface rock of the Blue Ridge and Piedmont provinces is predominantly ancient, highly deformed metamorphic granite gneisses, schists, amphibolites, and quartzites. Younger igneous intrusive rock includes granite, diorite, syenite, diabase, and coarse-grained pegmatites. In many areas, sound unaltered rock lies below the soil mantle. In the Coastal Plain, relatively recent marine sediments about 4,000 feet thick rest on a base of the older crystalline rock. These sediments consist of gravels, sands, silts and clays, marls, and soft limestones. No major faults are known.

The typical red-yellow alluvial soil of the valleys and intermountain areas of the Blue Ridge province is derived principally from schists and some mica gneiss.

The principal soils of the Piedmont province are derived from granites, gneisses, and schists. A distinctive feature separating the Piedmont province from the Upper Coastal Plain is the sandhills of the Fall Line. These were formed from deep sandy soils.

The Upper Coastal Plain soils originate principally from marine sediments with sands, sandy limestone, and clays with sand predominating. Soils of the Upper Coastal Plain are among the most productive in the basins.

Lower Coastal Plain soils were derived from more recent sediments. They are sandy and tend to be dry or excessively wet, depending on topography and internal drainage. The flat topography and the dense character of the sediments retard runoff and movement of water through the soils in most of this area. In addition, many of the swamps are filled with organic matter which slows runoff.

Climate

The climate of the basins is mild. The southern areas are warmer in the winter and receive more rain in the summer and fall than the Piedmont and interior parts. Snowfall is rare except in the mountain region.

The average annual temperature is around 65°. Near the coast, the air temperatures during a typical January day range from 45° to 60° Fahrenheit, and in July from 70° to 90°. In the mountains, a typical January day ranges in temperature from 30° to 50°, and in July from 60° to 80°. The daily minimum temperature drops below 32° in the upper basins about 80 times during an average year and in the coastal area about 10 times per year. In an average year, temperatures of 90° or higher are reached 70 times near the coast, 90 times in the central portion, and 30 or less in the mountains. The frost-free growing season of the basins ranges from 210 days in the Piedmont province to 280 days along the coast.

There is a daily average of 9 to 10 hours of sunshine in the summer and 5 to 6 hours in the winter. Summer rainfall is characterized by brief showers, and there are few completely cloudy days. Southern Florida and the arid West are the only United States regions that receive more winter sunshine than the Southeast River Basins area.

Livestock require little, if any, winter housing and can graze 9 to 12 months of the year. Other agricultural benefits of the mild climate include diversification of crops and rapid production of timber. Industry and commerce also benefit from the mild climate. The generally frost-free soil reduces construction and maintenance costs. Construction is possible throughout the year. Normal highway and waterway use is not curtailed during the winter.

CLIMATE

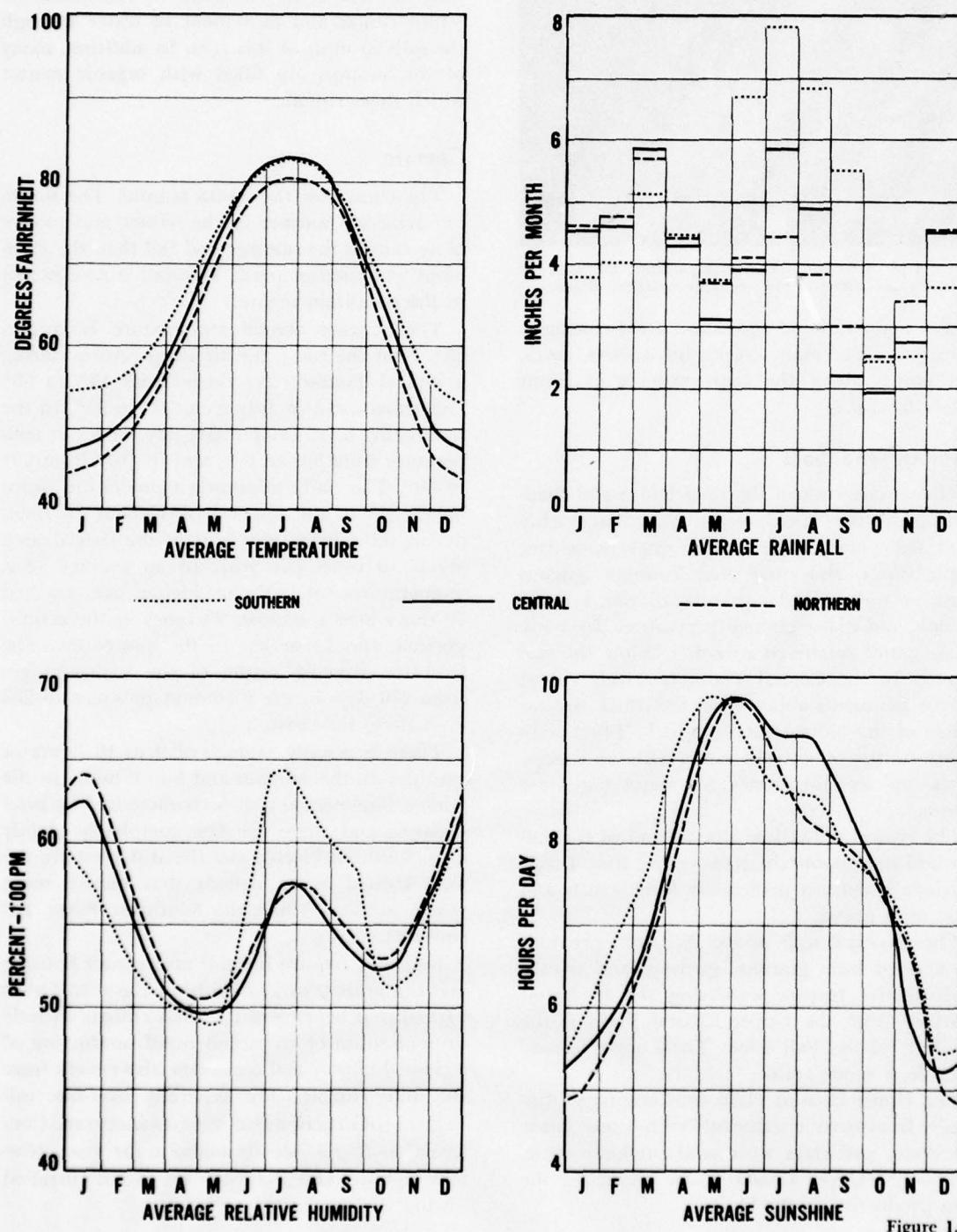


Figure 1.14

The average yearly rainfall totals 48 inches in the central part, more than 60 inches in the mountains, and 56 inches along the coast. Rainfall during June, July, and August averages about 5 inches per month. Rainfall during the 3 driest months, September, October, and November, averages nearly 3 inches. A maximum 24-hour precipitation of 12.7 inches was recorded at Alaga, in Houston County, Alabama, in July 1916. Severe droughts are uncommon, but brief deficiencies occur frequently.

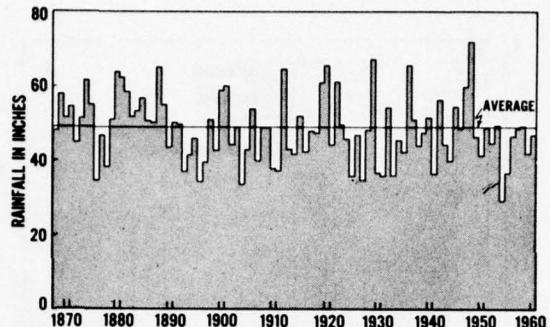


Figure 1.15 Yearly Precipitation at Atlanta.

SECTION II – BASINS RESOURCES

Land

There are some 12,417,000 acres in the Apalachicola-Chattahoochee-Flint basins, exclusive of large and small water bodies.

Forest lands total 8,169,000 acres, or 66 percent of the land area. In the Blue Ridge province, forests cover 82 percent of the land; in the Piedmont province, 73 percent; in the Upper Coastal Plain, 60 percent; and in the Lower Coastal Plain, 91 percent. Flood plains are predominantly forested.

In 1959, there were 2,246,000 acres of cropland in the basins. About 1,153,000 acres were used for pasture. Urban and other land uses, including small water bodies, totalled nearly a million acres.

Corn is grown on about 828,000 acres, peanuts on 349,000 acres, and cotton on 200,000 acres.

Other crops in the decreasing order of acres of land use are hay, fruits and nuts, small grain, commercial truck, soybeans, tobacco, and sweet potatoes.

The largest single source of cash farm income is from poultry, followed by peanuts, cotton, fruits and nuts, commercial truck crops, tobacco, cottonseed, horticultural specialities, and soybeans. The value of beef and veal approaches that of cotton. Eggs, dairy products, and pork are also important sources of income.

The Piedmont province is one of the leading poultry production areas of the Nation. Topography and soils are generally best suited to pasture and cover crops which require little cultivation. However, there are many areas where the topography is suitable for cultivation. In these areas the soil is intensely farmed and is highly

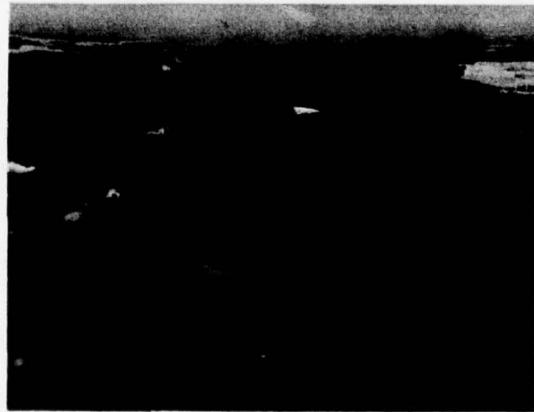


Figure 1.16 Bottom Land Forest Provides Much of the Basins Hardwood.



Figure 1.17 Pecan Orchard, Used for Pasture, Demonstrates Dual Use of Land.

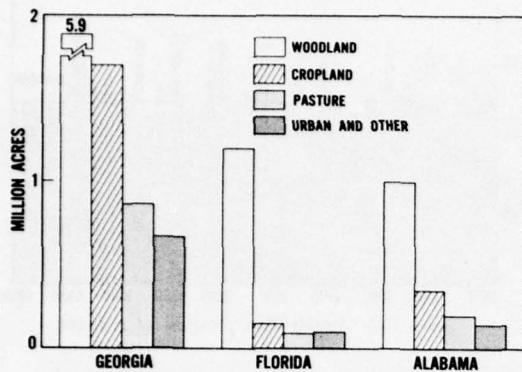


Figure 1.18 Land Use in the Apalachicola-Chattahoochee-Flint Basins—1960.

productive. An area in the lower Piedmont province produces a large part of the pimento peppers of the Nation. The rolling and sometimes prairie-like lands of the Upper Coastal Plain are well suited to general farming. Nearly all crops can be grown. There are many peach orchards in the lower Piedmont and in the northern parts of the Coastal Plain. The Upper Coastal Plain is well suited to pecans, and a wide belt of orchards across the center of the province produces a large part of the national crop. Areas farther south are suitable for peanut, melon, and commercial vegetable production. Many kinds of vegetables can be grown. This area in southern Alabama and Georgia and northern Florida offers a good opportunity for increased production of commercial truck crops to support an expanding freezing and canning industry. There are many livestock farms in the basins.

There are about 28,000 miles of improved county, State, and Federal highways. Highways and railroads occupy about 200,000 acres of rural land. Streets in the cities and towns require another 136,000 acres. Dothan, Alabama; Marianna, Florida; and Albany, Atlanta, and Columbus, Georgia, have commercial airports; and several smaller cities, communities, companies, and individuals have noncommercial airports that occupy a total of about 7,000 acres. Residential areas occupy about 120,000 acres. Another 74,000 acres are used for schools, churches, and service areas. Industrial sites occupy about 30,000 acres. About 189,000 acres are in military installations. There are wayside and local parks, boating and swimming areas, numerous scenic and his-

toric sites, and about 60 miles of coastal beaches that are used for recreation. Scattered throughout the basins are numerous hunting plantations.

In the Lower Coastal Plain, farms are few and the population sparse. Hardwood hammock swamp, titi swamp, and pine flatwoods cover more than 90 percent of the area. There are about 17,600 acres of salt marsh along the coast.

Water

An ample supply of surface water is available in most of the area. The Piedmont province with its relatively impermeable underlying rock contributes a large part of the surface runoff. The annual runoff averages about 18 million acre-feet, or about 17 inches of water over the entire drainage area. This is about twice the United States average and slightly greater than that of the Southeast as a whole. Evaporation and transpiration account for almost all the 35-inch average difference each year between rainfall and runoff. Total streamflow varies greatly from year to year. The greatest annual flow in the Chattahoochee River at West Point, Georgia, occurred in 1929 and was equivalent to 38 inches of runoff. The smallest annual flow at West Point occurred in 1955 and amounted to about 11 inches. The average annual runoff per unit of area for the Chattahoochee River is slightly larger than that of the Flint River.

Ground water is not plentiful in the Blue Ridge province. It becomes somewhat more abundant in the Piedmont province and is plentiful in the Coastal Plain where the under-

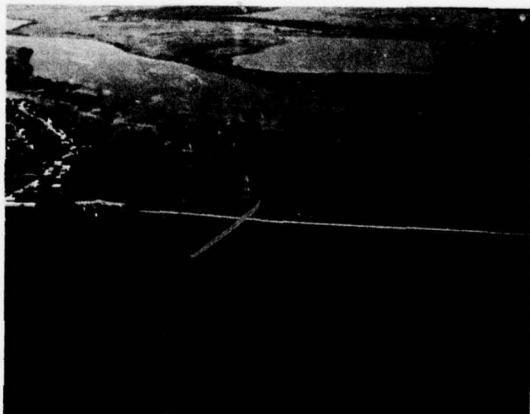


Figure 1.19 Apalachicola River, near the Mouth, Is Spanned by Gorrie Memorial Bridge.

lying permeable limestone is the major source of water for deep wells. Layers of sand, gravel, and clay interposed between this permeable limestone and the ground surface provide water for shallow wells.

In the Piedmont and Blue Ridge provinces, typical wells generally yield 5 to 25 gallons per minute and rarely yield more than 100 gallons per minute. Yields in the coastal area vary from 100 to more than 2,500 gallons per minute. Greater amounts are obtained from the principal artesian aquifer — called the Floridan Aquifer — that underlies the southeastern part of the study area.

The depth to water in the zone of the principal artesian aquifer varies from zero to about 500 feet. The water-bearing formation varies in thickness from a few feet to several hundred feet. In general, the depth and thickness of the formation increases as it nears the coast. There are many large springs and wells in the aquifer which yield several thousand gallons per minute. The aquifer, a relatively porous formation, intersects the ground surface south of the Fall Line. This recharge zone averages about 40 miles wide and roughly parallels the Fall Line.

In the Cretaceous zone, which averages 50 miles in width immediately below the Fall Line, there are many artesian springs. Wells frequently yield between 1,000 and 2,000 gallons per minute and well depths to 1,000 feet are common. Generally, the ground water supply is chemically neutral and the average hardness is about 60 parts per million. While conditions vary from place to place, the ground water is better than that of most other regions. Little or no treatment, other than protection from outside contamination, is needed to meet sanitary standards.

Most of the surface water in these basins is among the purest and softest available. Surface water hardness averages about 25 parts per million of total dissolved solids. Average hardness for the United States is about 300 parts per million. Pollution problems exist in reaches of the rivers and tributaries below some of the cities and towns.

Sediment concentrations of 10 to 100 parts per million are typical of the Coastal Plain streams and 10 times this amount occurs in the Piedmont streams. The sediment load increases with increased flows, and of the total load moved by

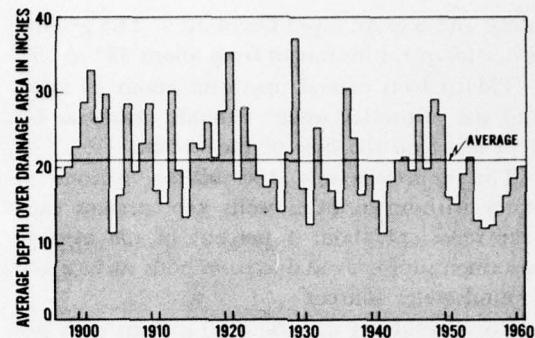


Figure 1.20 Annual Runoff, Chattahoochee River at West Point.

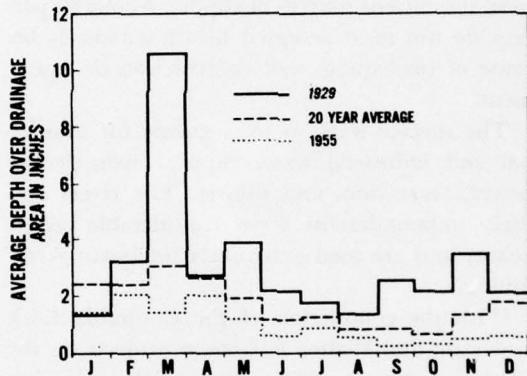


Figure 1.21 Monthly Runoff, Chattahoochee River at West Point.

the streams, 90 percent is carried by flows occurring 10 percent of the time. Loads at specific locations vary considerably from the averages.

Farms use an average of 18,200 acre-feet per year for irrigation and approximately the same amount to water livestock. Water uses for all rural purposes total about 52,900 acre-feet per year, or approximately 17 percent of the water used in the basins.

Municipal water consumption in the basins averages about 101 gallons per day per person, while the average for the Southeast is 116 gallons a day per person, and the average for the Nation is 147 gallons. Municipal water use in the basins totals 199.2 million gallons a day. Approximately 18 percent, or 35.7 million gallons per day, of this total demand is for industrial purposes. Industrial use totals about 59.4 million gallons a day.

The temperature in the larger streams varies from 45° Fahrenheit in winter to 80° in summer. The smaller streams have an even greater

range and a more rapid fluctuation. The ground water temperature ranges from about 55° to 70°.

Tidal effects extend upstream about 25 miles and the salt-water wedge extends nearly as far depending on the flow of the stream.

The approximately 100 billion gallons of water withdrawn from wells and streams each year represent about 1 percent of the average sustained supply available from both surface and ground water sources.

Rural residents use about 50 gallons each per day or a total of about 14.2 million gallons per day. About 8 percent of these domestic supplies have insufficient sources of supply. About 62 percent do not meet accepted health standards because of inadequate well construction or equipment.

The surface water is used mostly for municipal and industrial water supply, hydroelectric power, recreation, and fishing. The rivers and their impoundments have considerable scenic beauty and are used extensively for boating and fishing.

With the completion of the Columbia Lock and Dam and Walter F. George projects on the Chattahoochee in 1963, commercial navigation will extend 273 river miles upstream from the

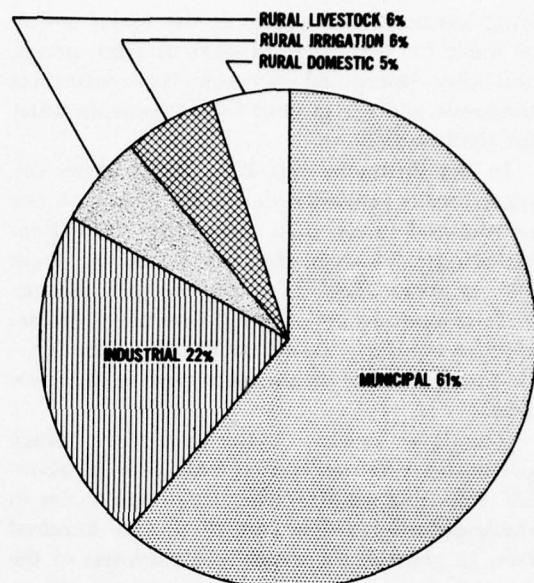


Figure 1.22 Water Withdrawal in 1960.

mouth of the Apalachicola River to Columbus, Georgia, on the Chattahoochee River and 142 river miles to Bainbridge, Georgia, on the Flint River. The Gulf Intracoastal Waterway along the coast provides a protected route for commerce and pleasure craft.

SECTION III – PEOPLE IN THE BASINS

History

The Indians who lived in the Alabama and Georgia portions of the basins belonged to two great tribes, the Cherokee and the Creek. The Cherokees occupied the mountainous section and the Creeks the Piedmont and Coastal Plain. The Apalachee Indians occupied northwest Florida. All of these tribes were well organized, occupied permanent towns, farmed the land, and were more civilized than most other Indians in the United States. In 1540, Hernando de Soto explored parts of southwestern Georgia and noted "clear land with many cornfields."

In the latter part of the seventeenth century, the Spaniards began establishing their missions and presidios in the Apalachee region of northern Florida and southwestern Georgia. Far up the Chattahoochee River they built the mission, Savacola, in 1680, and the next year they set up Santa Cruz de Savacola at the forks of the Chat-

ahoochee and the Flint Rivers. The Spanish Trail linking the missions between St. Augustine and Pensacola crossed the basins near Bainbridge, Georgia.

In most of the area the earliest arriving white men were traders. Partially to correct grievances caused by traders and to forestall trouble being fomented by the French and Spanish, General Oglethorpe, in 1739, met the chiefs of the Creek Indian Nation in a conference assembled at Coweta, an Indian town in what is now Russell County, Alabama. There the Indians reaffirmed their allegiance to the British Crown and their agreement made with the Colony of Georgia when it was established in 1733.

The great interior lands of Georgia, including the Apalachicola-Chattahoochee-Flint basins, were owned and occupied by Indian tribes until about 1800. After that time, encroachment by settlers led to numerous clashes. Each war with

the Creeks was ended with a treaty which pushed the Indians farther west.

In 1819 a treaty of cession was agreed upon between Spain and the United States, and in 1821, the transfer of Florida took place. By 1827 the last of the Creek lands in Georgia was ceded to the United States and these Indians moved west of the Chattahoochee River. In 1817 and 1819 the Cherokees made treaties relinquishing small strips of land in northeastern Georgia, parts of which were in the basins. In 1835 the Cherokee Nation ceded all its lands east of the Mississippi River and agreed to move west of that river. After long and bitter legal struggles and maneuvers, the Cherokees finally were rounded up by troops in 1838 and moved to Indian Territory, now the State of Oklahoma.

Settlement of the basins was rapid after 1800 and thousands of farms were developed. Most settlers came from eastern Georgia, the Carolinas, Tennessee, Kentucky, and Virginia. The majority of the people were of Anglo-Saxon, Scottish, and Irish stock but also included German, French, and Spanish settlers. Many Negro slaves were brought in to work on the larger farms and plantations.

In the absence of satisfactory methods of overland transport, the early settlers in this region occupied land adjacent to the rivers. Large plantations were operated along practically the entire length of the Chattahoochee and Flint Rivers. Each had a landing where river boats could tie up to transfer cargo.

The first steamboats appeared around 1830. The channels were obstructed by sunken logs, rocks, and gravel shoals so that navigation was possible only during high water. At such times boats would venture to remote reaches of even the smaller tributaries to reduce the slow and difficult overland haul of heavy freight to a minimum. River transportation on the Chattahoochee and Flint Rivers developed rapidly, principally to move large amounts of cotton from west Georgia and east Alabama to Apalachicola, Florida, for transshipment to east coast cities and abroad. Soon regular boat lines were established on the Apalachicola and Chattahoochee Rivers between Columbus, Georgia, and the Gulf; on the Flint River to Bainbridge, Georgia; and on the lower reaches of the Chipola River.

During high water frequent trips were made to Marianna, Florida, on the Chipola River, and to Albany, and often to Montezuma on the Flint River.

As the lands away from the rivers were settled, trails and roads were built. Chartered stage companies constructed many roads between towns. The 1840's and 1850's saw expansion of the railroads through the central regions of the basins. The location of railroads had a decisive effect upon the location and subsequent development of many communities. The outstanding example is Atlanta which was founded at a railroad junction.

During the Civil War, Columbus was one of the most important manufacturing centers of the South, possibly second only to Richmond in this respect. It produced all varieties of military supplies, including cannon and gunboats. It was the site of a Confederate Naval Works. In the summer of 1864, the upper part of the Apalachicola-Chattahoochee-Flint basins was invaded; and after a series of battles, Atlanta was occupied by Union forces. The city was burned as the Federal army began its march to the sea. Two of the last battles of the war were fought on April 16, 1865, at West Point and Columbus.

The physical, and to some extent the economic, recovery of the area after the Civil War was rapid. Atlanta was rebuilt and began its unabated growth. Other cities and towns prospered.

The economic structure was based on agriculture and forest products. In the post Civil War period farmers resumed growing the one thing they knew best — cotton. There was little market for anything else. Consequently, many prospered or suffered as the market for this one crop rose or fell. Since that time, education, economic factors, and technological advances have changed the character of farming in the basins. These changes, which have been most rapid in the last 30 years, have brought about a more self-sustaining and balanced agriculture. As a result of greatly improved management and farming methods, including mechanization, agriculture requires fewer people to produce an increasing amount of agricultural products. Although agriculture remains basic to the economy, other segments of the economy provide a high percentage of the employment and gross income.

Population Development

The Apalachicola-Chattahoochee-Flint basins had a total population of 1,621,000 in 1960. This was a 51-percent increase over the 1930 population. During the same period, the population of the United States increased 45.6 percent and that of the Southeast River Basins by 34 percent.

The Georgia portion of the three-State area has about 86 percent of the total population. Alabama has about 10 percent of the population and Florida less than 4 percent. There has been a big difference between State areas in the rate of population growth during the past three decades. Since 1930, the population of the Georgia portion has increased about 61 percent, that of the Florida portion by 17 percent, and that of Alabama by 9 percent. These trends are expected to continue in the future.

TABLE 1.1
Population of Apalachicola-Chattahoochee-Flint
Basins by States
(thousands)

State	1930	1940	1950	1960
Alabama	149	151	162	162
Florida	52	55	57	61
Georgia	870	984	1,139	1,398
Total	1,071	1,190	1,358	1,621

The present population is about 65 percent urban as compared to 54 percent urban for the Southeast River Basins. In 1950, population was about equally divided between rural and urban. The urban population has been gaining rapidly while rural population has declined substantially during recent years.

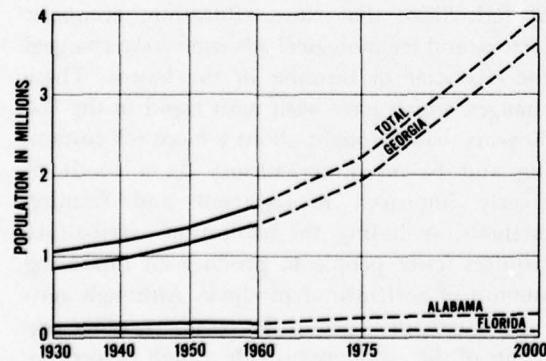


Figure 1.23 Population Distribution by States.

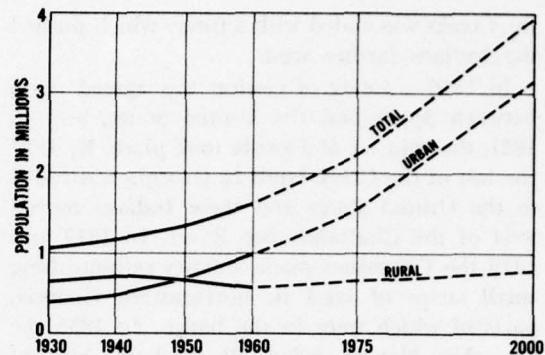


Figure 1.24 Urban and Rural Population.

TABLE 1.2
Urban and Rural Population of A-C-F
Basins by States
(thousands)

Location	1930	1940	1950	1960
Urban				
Alabama	45	49	70	94
Florida	12	15	17	20
Georgia	332	416	590	910
Total	389	480	677	1,024
Rural				
Alabama	104	102	92	68
Florida	40	40	40	41
Georgia	538	568	549	488
Total	682	710	681	597

Most of the growth in urban population has been in and around the larger metropolitan centers. The population of the Atlanta metropolitan area has more than doubled since 1930.



Figure 1.25 The Downtown Atlanta Skyline—1962—
Illustrates the Basins Expanding Economy.

POPULATION DENSITY 1960

INHABITANTS PER SQUARE MILE
BY COUNTIES

- 0 TO 20
- 21 TO 60
- 61 TO 100
- OVER 100

CITIES AND METROPOLITAN AREAS

- UNDER 2,500
- 2,500 TO 10,000
- 10,000 TO 30,000
- 30,000 TO 90,000
- 90,000 TO 300,000
- 300,000 TO 1,000,000
- OVER 1,000,000



SCALE IN MILES
0 10 20 30

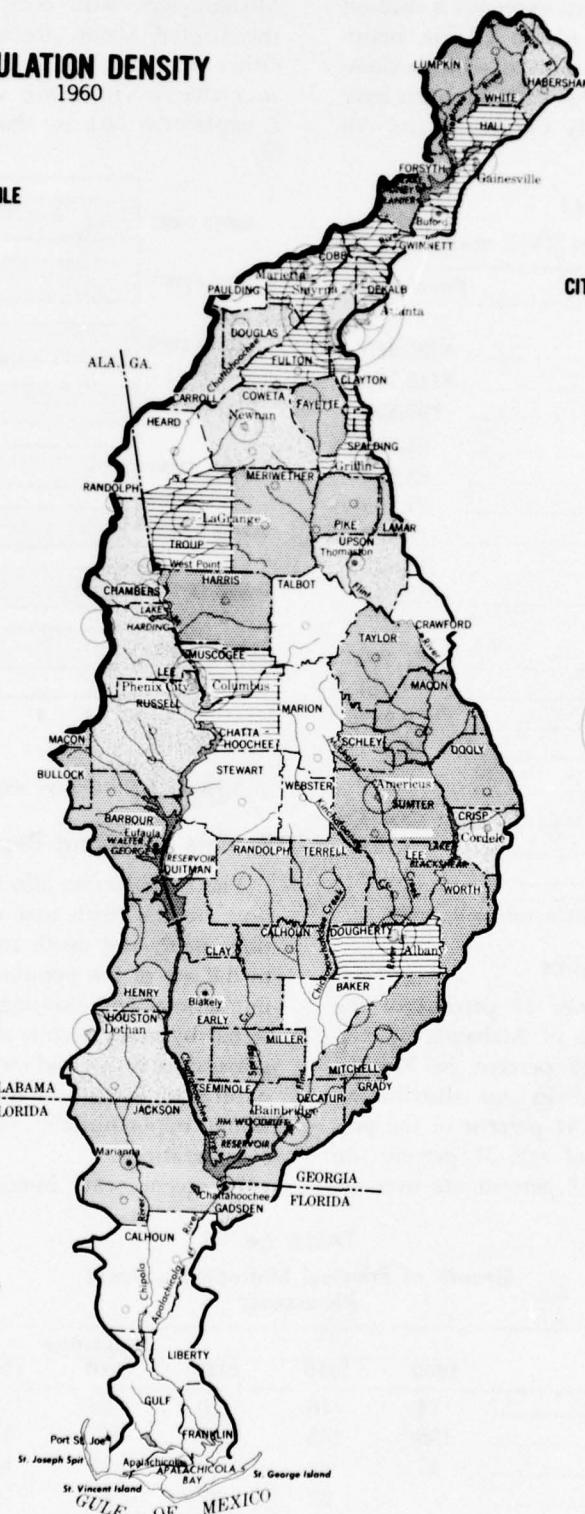


Figure 1.26

The population of this area exceeded a million in 1960. About two-thirds of the Atlanta metropolitan population is in the Apalachicola-Chattahoochee-Flint basins. Other urban centers have grown rapidly, particularly Columbus and Albany, Georgia.

TABLE 1.3
Population of Cities (1960 census)

City and State	Population
Georgia	
Atlanta	*487,455
Columbus	*116,779
Albany	*55,890
Marietta	25,565
LaGrange	23,632
Griffin	21,735
Gainesville	16,523
Americus	13,472
Bainbridge	12,714
Alabama	
Dothan	*31,440
Phenix City	27,630
Eufaula	8,357
Lanett	7,674
Florida	
Chattahoochee	9,699
Marianna	7,152
Apalachicola	3,099

* Includes only population within corporate limits.

Population Characteristics

Nonwhites comprise over 44 percent of the population of the basins in Alabama, 37 percent in Georgia, and 25 percent in Florida. There is little variation in age distribution among the States. About 41 percent of the people are under 18 years of age, 51 percent are between 18 and 65, and 8 percent are over 65.

Median ages, with comparisons to States and the United States, are shown in Figure 1.27. Other Apalachicola-Chattahoochee-Flint population characteristics are shown in Figure 1.28. Comparative data are shown in Figure 1.29.

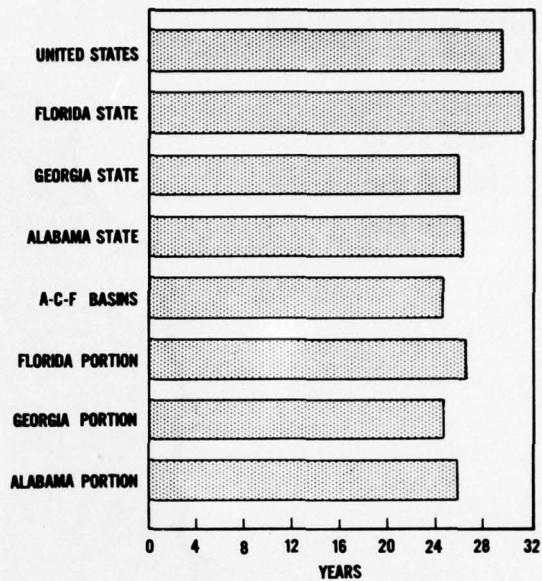


Figure 1.27 Median Age of Population—1960.

Factors Affecting Population Change

The basic factors affecting changes in population are the birth and death rates and migration. Birth and death rates are directly related to the age of the population and the age of the in-migrants and out-migrants. Migration is affected by many factors such as employment opportunities inside and outside the basins, climate, natural resources and their development, educational opportunities, and social and political considerations.

In recent years in-migration and out-migra-

TABLE 1.4
Growth of Principal Metropolitan Areas
(thousands)

Metropolitan area	Population						
	1900	1910	1920	1930	1940	1950	1960
Albany	14	16	20	22	29	44	76
Atlanta	198	283	349	462	559	727	1,014
Columbus	57	62	72	85	111	158	205
Dothan	—	32	37	46	46	46	51

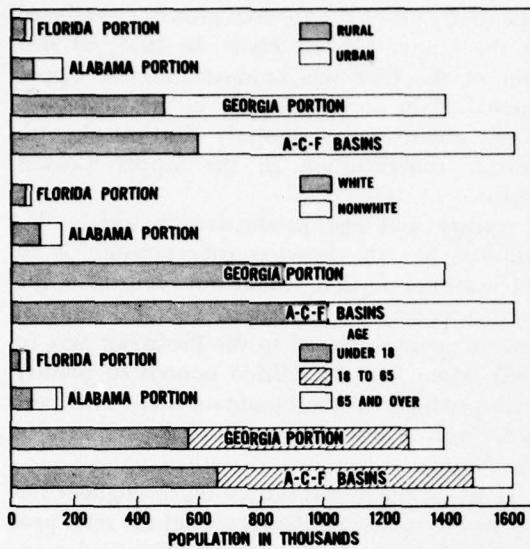


Figure 1.28 *Population Characteristics—1960—for Residents of the A-C-F Basins.*

tion have been an important influence in population growth of the Apalachicola-Chattahoochee-Flint basins. Population declines have occurred in rural areas on a nationwide basis. The absence of new jobs in a rural area leaves few alternatives for the young people when they enter the labor market; their only recourse is to seek a job in the city. The reduction in farm labor more readily affects Negroes, and Negroes

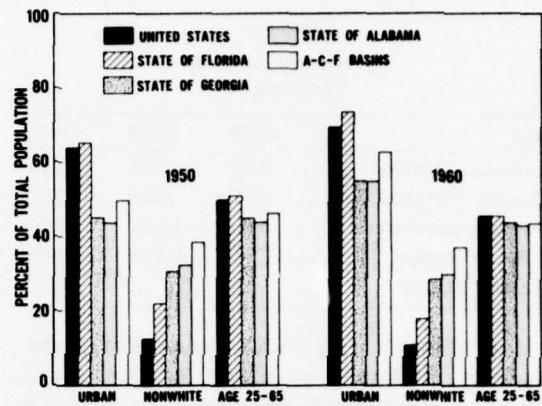


Figure 1.29 *Comparative Population Characteristics of A-C-F Basins, States, and Nation for 1950 and 1960.*

of all ages are leaving the rural areas of the basins at a rate considerably faster than white people of comparable ages.

With the loss of the young white people and the Negroes from rural areas and the concentration of population growth in Atlanta and other cities, future overall birth rates are expected to decline in the rural areas. Such effects should be gradual, however, and a high birth rate in urban areas, which is expected to be characteristic of the region for the next several decades, should offset out-migration and help produce a continuing increase in total population.

SECTION IV – BASINS ECONOMY

Existing Economic Development

The Apalachicola-Chattahoochee-Flint basins form the largest of the eight basin study areas of the Southeast River Basins in expanse, population, and economic activity. They have extensive land and water resources, a wide variety of economic activities, and a rapidly growing population. This forms a broad substantial base for continued and accelerated economic growth and development.

The relatively more rapid rise of per capita income in the basins and the South, compared to the Nation, has been due to the reduction in numbers employed in low-paying pursuits, such as part-time or subsistence farming, and to the substantial increase in employment in higher

paying jobs, such as manufacturing and other nonagricultural employment. Other contributing factors which are expected to result in higher personal income levels in the basins are: (1) The continuing rise in educational levels; (2) a shift to types of manufacturing that have a higher value added; and (3) increased urbanization.

Per capita income in the State portions of the Apalachicola-Chattahoochee-Flint basins and the United States, in January 1960 dollars, is shown in Table 1.5.

In 1960, a total of about 595,000 people were employed in the basins. About two-thirds were employed in nonagricultural and nonmanufacturing activities, one-fourth in manufacturing, and one-tenth in agriculture.

TABLE 1.5
Per Capita Income
(dollars)

Area	1939	1950	1960
Alabama portion	340	707	1,145
Florida portion	460	976	1,208
Georgia portion	695	1,503	1,907
A-C-F basins	638	1,386	1,805
United States	—	—	2,222

Agriculture is a significant component of the economy. Although agricultural employment is declining, more than 56,000 people are employed in agriculture, and agricultural production is increasing. In 1959 the gross receipts from farming were over \$212 million and net farm income was \$31 million. About two-fifths of this was from field-crop products, with peanuts and cotton being the major crops in value. About three-fifths was from livestock products, including poultry, beef, eggs, dairy products, and pork, in the order of their value.

With few exceptions, farm production is distributed among the State sections of the basins in about the same proportion as their areas. Poultry production is heavily concentrated in Georgia. Eighty percent of the tobacco grown was produced in Georgia. Practically all of the rest was produced in Florida.

Variations among physiographic areas are important with respect to agricultural production. Farm activities are heavily concentrated in the Upper Coastal Plain and Piedmont areas of the basins.

Except for minor scattered acreages in the Piedmont and Lower Coastal Plain, most of the peanuts are produced in the Upper Coastal Plain.

Essentially all of the tobacco grown is produced in the Upper Coastal Plain. In 1959, 69 percent of the beef was produced in the Upper Coastal Plain and 30 percent in the Piedmont. Pork production is similarly distributed with heavier concentration in the Upper Coastal Plain.

Poultry and egg production is widely distributed but the heaviest concentration is in the northern portion. About three-fourths of the poultry production, or more than 250 million pounds, were produced in the Piedmont area in 1959. More than 32 million pounds of poultry were produced in the mountain area. This part of Georgia is a major poultry producing area of the Nation.

Dairy production is carried on throughout the basins but more than 50 percent of the total production is in the Upper Coastal Plain and more than 40 percent is in the Piedmont.

Forestry is important throughout the basins. Oak-pine production is heaviest in the Blue Ridge and Piedmont, and naval stores are produced primarily in the Coastal Plain.

Agricultural employment accounted for about one-fourth of all people employed in the Florida portion of the basins; one-sixth of total employment in the Alabama portion; and one-twelfth of the total employment in the Georgia portion.

In 1960 about 139,000 people were employed in manufacturing activities. Textiles, the leading category of manufacturing employment, had almost 47,000 people. Other categories of manufacturing activity, in the order of magnitude of employment, include: Metal, food, apparel, miscellaneous, lumber and wood, printing and publishing, pulp and paper, chemical, and stone, clay, and glass.

TABLE 1.6
Employment by Major Categories and State Areas — 1960
(thousands of employees)

Basin area	Agriculture		Manufacturing		Other*		Total	
	(no.)	(percent)	(no.)	(percent)	(no.)	(percent)	(no.)	(percent)
Alabama	7.9	14.0	11.3	8.2	28.1	7.0	47.3	7.9
Florida	3.8	6.8	2.0	1.4	11.3	2.8	17.1	2.9
Georgia	44.6	79.2	125.4	90.4	360.9	90.2	530.9	89.2
Total	56.3	100.0	138.7	100.0	400.3	100.0	595.3	100.0
Percent of total		9.5		23.3		67.2		100.0

* Nonagricultural—nonmanufacturing.

ECONOMIC ACTIVITY 1960

MAJOR INDUSTRIES

- A APPAREL
- C CHEMICALS
- F FOOD
- IC INDUSTRIAL COMPLEX
- L LUMBER
- M METALS
- O OTHER
- P PULP AND PAPER
- PR PRINTING AND PUBLISHING
- S STONE, CLAY AND GLASS
- T TEXTILES

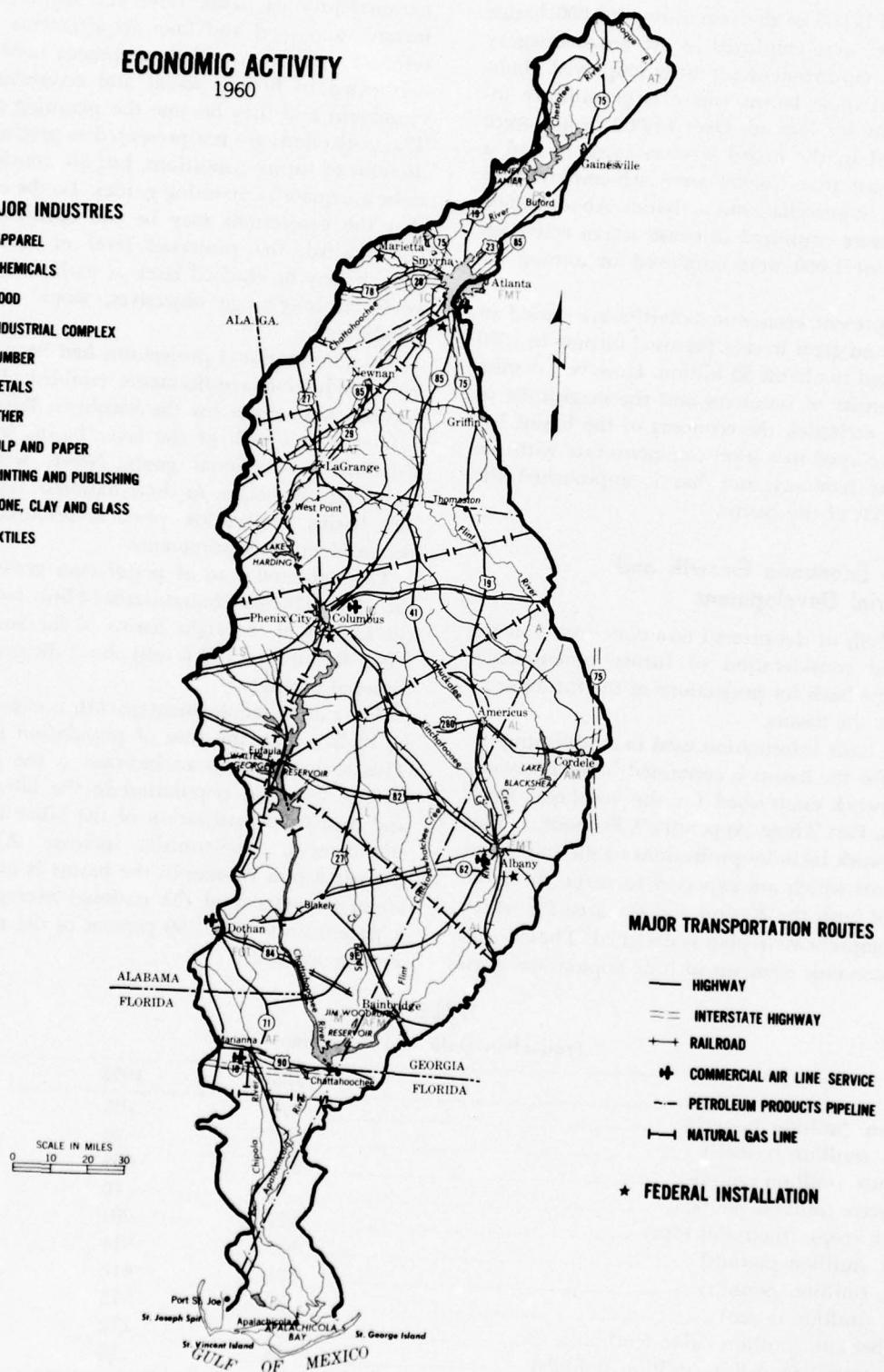


Figure 1.30

Over 133,000 of the remaining 400,000 basins employees were employed in the broad category of trade. Government activities employed about 89,000 in these basins where large military installations are located. Over 81,000 people were employed in the broad services category and a little more than 70,000 were self-employed or engaged in miscellaneous activities. About 26,000 people were employed in construction activities, and about 1,000 were employed in mining activities.

The present economic activities are varied in nature and great in size. Personal income in 1960 amounted to almost \$3 billion. However, despite the quantity of resources and the magnitude of present activities, the economy of the basins has not developed to a level commensurate with the national economy, nor has it approached the potentials of the basins.

Future Economic Growth and Industrial Development

Analysis of the present economic base and the detailed consideration of future potentialities form the basis for projections of the future economy of the basins.

The basic information used in establishing the goals for the basins is contained in an Economic Framework established for the Southeast River Basins, Part Three, Appendix 9, Economics. This framework includes projections of the important elements which are expected to shape the economy of both the Nation and the area for which the comprehensive plan is designed. These social and economic elements include population, gross

national product, labor force and employment, income, and food and fiber requirements. The resource utilization and development needs are delineated to fit this social and economic environment and they became the planning goals. The projections are not presented as precise predictions of future conditions, but are considered to be adequate as planning guides. To the extent that the projections may be too optimistic or conservative, the projected level of economic growth may be reached later or earlier, but the goals, as long-range objectives, would not be invalidated.

After the national projections had been made and production requirements established, projections were made for the Southeast River Basins area and each of the river basins by subdividing the regional goals. Needs were determined in relation to these national, regional, and basins projections, physical resources and the production requirements.

The expected rate of population growth for the Apalachicola-Chattahoochee-Flint basins is the highest of the eight basins of the Southeast River Basins area and is well above the projected national average.

The rate of employment growth is expected to be higher than the rate of population growth. This is due to both an increase in the proportion of the total population in the labor force and to a fuller utilization of the labor force as employment opportunities increase. Although the per capita income in the basins is now only about 80 percent of the national average, it is expected to be about 90 percent of the national average in 2000.

TABLE 1.7
Production Data and Projections

Item	1959	1975	2000
Cotton (million pounds)	77	125	214
Corn (million bushels)	18	23	36
Peanuts (million pounds)	354	668	1,049
Tobacco (million pounds)	7	10	14
Truck crops (thousand tons)	127	201	324
Meat (million pounds)	568	911	1,473
Milk (million pounds)	331	613	1,142
Eggs (million dozen)	50	72	127
Timber cut (million cubic feet)	199	272	394
Commercial food fish (million pounds)	14	18	30

TABLE 1.8
Economic Factors and Projections

Year and area	Population (1,000)	In- crease over 1960 (pct.)	Employ- ment (1,000)	In- crease over 1960 (pct.)	Per capita income*	In- crease over 1960 (pct.)
1960						
United States -----	180,000	---	67,000	---	\$2,222	---
Southeast River Basins -----	4,948	---	1,753	---	1,582	---
A-C-F basins -----	1,621	---	595	---	1,805	---
1975						
United States -----	235,000	31	89,000	33	3,012	36
Southeast River Basins -----	6,408	30	2,343	34	2,202	39
A-C-F basins -----	2,244	38	840	41	2,480	37
2000						
Southeast River Basins -----	380,000	111	148,000	121	4,733	113
United States -----	10,050	103	3,789	116	3,922	148
A-C-F basins -----	3,956	144	1,526	156	4,362	142

* 1960 price levels.

As economic development continues, employment is expected to more than double in the next 40 years. Manufacturing employment is projected to increase from about 139,000 in 1960 to about 367,000 in 2000.

The largest gains in manufacturing employment are expected in the metal industries. Population growth, especially that of the urban population, increasing market demand, and advancing technology are expected to make the potentials of the metal industries particularly favorable. Employment in this category is projected to increase fivefold by 2000.

Food processing is the second largest category of manufacturing employment. Rapid gains in employment are expected to meet the food demands of an expanding population and market. It is expected that employment in this category will exceed 45,000 by the year 2000.

The apparel industries are now the third largest category of manufacturing employment and continued rapid growth is expected. Employment in the apparel industries is projected to grow to nearly three times the 1960 figures by the year 2000.

Large gains in miscellaneous manufacturing employment are also expected as economic growth and technology advance. A growing and changing market demand is expected to encour-

age new products and new manufacturing activities, particularly after 1975.

Although production in lumber and wood is expected to rise significantly in the future, increased mechanization and productivity will cause employment gains to be less than the production increases.

With a rapid population increase and continued growth of large metropolitan areas, employment in printing and publishing is projected to increase by almost five times in the next 40 years.

Employment is expected to more than double in the pulp and paper industries. The abundance of resources, particularly wood products and water, and a rapidly expanding market demand accounts for this expected growth.

Continued employment increases are expected in chemicals. Although the volume of employment is not now large, employment is expected to almost triple by 2000.

The basins have valuable resources that are basic to the stone, clay, and glass industries. The development and utilization of these resources have barely begun and the potential for further expansion is favorable. Employment is expected to increase by five times in the next 40 years.

Textile manufacturing is the only category not expected to show gains in employment. Al-

EMPLOYMENT

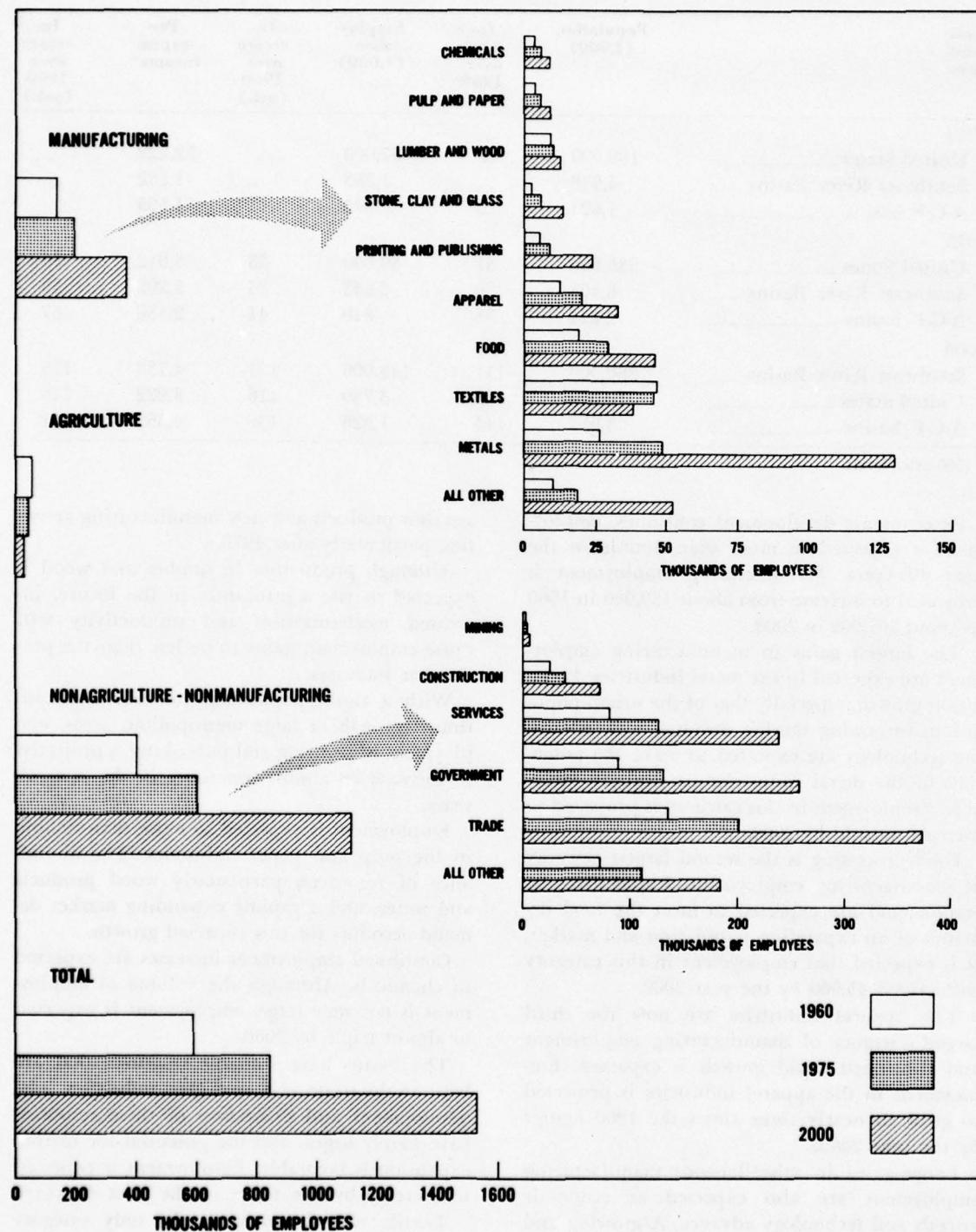


Figure 1.31

though it is expected to continue to be a major activity, an increase in automation and productivity is expected to result in a slowly declining labor requirement. By the year 2000, it is expected that textiles will rank third in employment.

With population growth and rapid increases in manufacturing activities, all major categories of nonagricultural and nonmanufacturing activity are expected to expand rapidly. Rapid population growth, particularly in the large urban areas, continued urbanization throughout the basins, and rising levels of income will be conducive to rapid growth in trades and services. The same is true of government employment. Defense installations are expected to continue. By 2000, about 375,000 persons are expected to be employed in trade and about 259,000 in government, including the public school system. The services category is projected to total about 238,000 and the self-employed and miscellaneous category about 184,000 by 2000.

The projected rate of population and economic growth is expected to be accompanied by a rapid rate of expansion in construction activities. Employment in this category is projected to almost triple in the next 40 years. Mining activities, which are now somewhat limited, are also expected to increase.

Future agricultural employment in the basins is expected to continue to decline to nearly one-half the 1960 employment; but as a result of continued mechanization, consolidation, and improved production technology, agricultural production is expected to increase substantially. Farms are expected to continue to increase in size and decrease in number. In 1960, about 56,000 people were employed in agriculture in the basins. This employment is projected to decrease to about 42,000 in 1975 and to about 32,000 by 2000.

The value of farm production is projected to increase from the 1959 gross of \$212 million to about \$378 million in 1975 and about \$616 million in 2000. This will be a significant increase in the physical volume of both crop and livestock production. The 1959 cotton and peanut production is expected to triple in the next 40 years. Production of tobacco and corn is expected to about double and large increases are expected in most other field crops.

The production of livestock and livestock

products, in general, should increase even more rapidly than that of other farm products. The production of beef and pork is expected to double by 1975 and triple by 2000. This will mean an increase in annual production of almost 500 million pounds of these two meat products in the next 40 years.

Over 335 million pounds of poultry were produced in the basins in 1959. The gross sale value was nearly \$49 million. The production of poultry will continue to increase to more than double present production. The production of eggs is expected to increase from the present 50 million dozen to about 127 million dozen by the year 2000.

The production of milk in the basins totals over 331 million pounds. With continued urbanization and a growing market demand, milk production is expected to double by 1975 and to more than triple by 2000.

Accompanying these rapid production increases will be corresponding projected rises in gross farm receipts and net farm income. Agriculture will continue to be a significant component of the economy.

Total woodland acreage is expected to gradually decrease over the next 40 years because of the increasing demand for other uses of land, but total forest production is expected to continue to increase. Improved management, advanced technology, and accelerated resource development are expected to increase forest production by about 40 percent by 1975 and to more than double it by 2000. A large proportion of this expected increased production will be pulpwood. Forestry should also continue to be an important segment of the economy.

Economic projections and the factors associated with them reflect a favorable outlook for the future economy of the Apalachicola-Chattahoochee-Flint basins. However, these projections can be met only with continued and accelerated development of all the basins resources. Industrial development must accompany the expansion in food and fiber enterprises.

Competition between smaller communities and between areas and States for new and expanded industrial development is exceedingly keen. For a community, an area, or even a State to attract industry, plans should be made that are based on the utilization of available re-

sources. These plans or programs must take into account the materials to be processed, markets for the products, means of delivery, and other related factors. There are several State and Federal agencies whose primary function is to help a community or area in the formulation of an industrial development plan. Once an acceptable plan has been made, it is the responsibility of the local people to implement and carry out the plan, although there are State and Federal agencies providing technical assistance and financial grants or loans.

The possibilities for expanding manufacturing activities which utilize quantities of local resources and available labor are particularly important. New products are being continually developed which require new locations or labor or materials.

Chemical plants producing fertilizers, insecticides, and herbicides are potential industries. Industries manufacturing container and packaging materials have a good market potential, particularly with the food-processing industries. Industries using wood products and lumber have a good potential. The outlook for the metal industries and for printing and publishing is excellent. There is extensive recreational potential throughout the area and especially along the Gulf coast. As this potential is developed, industries associated with boat building and repair, camping equipment, fishing gear, and similar enterprises will be needed.

For short-range planning to obtain immediate results, local resources should be examined and the possibilities for expansion under going programs determined. Many small industries may be able to expand with the help of local organizations.

The Small Business Administration, U. S. Department of Commerce, can make loans to finance the construction, conversion, or expansion of industrial plants and shipping centers for ownership or tenancy by small business concerns.

The Rural Development Program was established in 1955 as an interagency effort to solve some of the economic problems of rural underdeveloped areas. This program, now renamed the Rural Areas Development Program, is operating with renewed emphasis and involves co-operative efforts of many agencies, including

those of the U. S. Department of Agriculture and State colleges and universities. The land-grant colleges of each of the five States of the Southeast River Basins area are active in this work.

The Area Redevelopment Act of 1961 is directed toward creating needed new employment opportunities through the development of facilities and resources. The program offers five broad types of assistance. These include loans, grants, technical assistance, planning, and occupational training.

There is also increased opportunity under the Federal Housing Act to rehabilitate blighted residential, industrial, and commercial areas, and to obtain technical assistance and planning aid in cities, small towns, and counties.

Under provisions of the Job Training Act of 1962, trainable unemployed workers, members of farm families with low income and youths between 16 and 22 may be trained in those skills found to be in short supply.

The focal point in obtaining and utilizing assistance under these programs rests with local groups organized to effectively delineate the community's interests and initiate action toward obtaining desired objectives.

The Atlanta metropolitan area has many divergent industrial activities and good potential for continued growth. In such an area, complementary and satellite industries provide special resources or services for the basic industries, or they produce a product which is closely associated with the basic product. Because of its location, Atlanta is one of the major distribution points and financial centers of the Nation. Metropolitan Atlanta should continue to attract industrial development because of its market potentials, transportation facilities, financial opportunities, labor force, and other advantages found in large metropolitan areas.

Completion of navigation to Columbus and later to Atlanta on the Chattahoochee River and to Albany on the Flint River will open areas along these rivers to industrial developments which rely on bulk shipment of either raw material or finished products. Industries most likely to have an economic advantage would include earth products plants using or manufacturing clay, lime, fuller's earth, and ores; chemical plants using or manufacturing petroleum, plas-

tics, coke, and synthetic fibers; and metal plants, fabrication plants, ore reduction plants, and machinery and aircraft components plants.

The development of industry along the navigable rivers would offer opportunities for complementary and satellite industries to develop in the adjacent areas and communities. The projected increase in agricultural and forestry products will necessitate additional processing facilities, particularly for dairy products, meats, and truck crops. Apparel plants, especially those manufacturing the informal lines for both men and women, will have a market in the adjacent regions.

The projected increases in production of food and fiber and the expected increases in industrial activities will furnish jobs in trades, services, transportation, government, and other service-type industries required by modern society.

Social and Institutional Factors

Until recent years agriculture was the dominant way of life for most people of these basins. But in line with national changes, the society has undergone a transition from rural to urban living. The transition has been extremely rapid during the past two decades. Social and institutional factors have a bearing on the economy, and the rate of change is indicative of future progress.

A most dramatic and fundamental change has occurred in education. In 1940 there were many hundreds of small primary and secondary schools in the basins. Now the number is small. Generally, except in the larger cities, the primary and secondary schools are operated as consolidated county systems. In 1940 less than one-half of the white and less than one-fourth of the Negro public school teachers had attended college for 4 years. In 1958 about 82 percent of the white teachers and 93 percent of the Negro

teachers held bachelors or masters degrees. In the less urban areas, the educational level of the faculty is often as high as in the larger cities. There are 20 colleges and universities in the basins, including 7 whose students are predominantly Negro. Several thousand degrees are awarded annually, including about 70 medical degrees, over 650 engineering, and 300 industrial management degrees. There are four area and two State vocational technical schools in the basins, including two at Albany, Georgia; two at Columbus, Georgia; one at Americus, Georgia; and one near Dothan, Alabama. Seven other area schools will be constructed in Georgia at Marietta, Griffin, Atlanta, Thomaston, and near Decatur. These schools offer from 8 to 30 trade and technical courses. Other vocational schools are operated by city and local boards of education and as private concerns. In spite of these advantages, accelerated progress is needed in education as indicated by Table 1.9.

Hospital and health programs have improved in recent years. There are hospitals in nearly all counties. Many were constructed with State and Federal assistance under the Hill-Burton Act. There is a shortage of medical service in some of the smaller and more isolated areas. In 1957, there were about 90 physicians per 100,000 population as compared with 132 for the United States. Similar figures for dentists in 1958 were 28 and 57.

Municipal and other government services in most of the area are adequate for current needs. In some places where the population has declined and where the tax base is low, improvement of facilities and provision for services are difficult. Some municipalities have planning boards, and some have contracts with professional consultants for complete planning programs. Some cities have fully developed comprehensive plans with many necessary capital improvements already completed. Efforts toward

TABLE 1.9
Median Years of School Completed for Persons 25 Years Old and Over

Area	Total			White			Nonwhite		
	1940	1950	1960	1940	1950	1960	1940	1950	1960
Georgia	7.1	7.8	9.0	8.1	8.8	10.3	4.2	4.9	6.1
United States	8.6	9.3	10.6	8.7	9.7	10.9	5.8	6.9	8.2

economic improvements have generally been localized — towns, counties, and States compete. Many leaders recognize the need for consolidated

effort. Area organizations are already functioning, but there is a need for additional coordination to achieve basinwide resource development.

PART TWO - NEEDS AND OPPORTUNITIES

General

This Part of the Report discusses, for each purpose, the existing facilities and programs, needs and opportunities, and means of meeting the needs for resource development in the Apalachicola-Chattahoochee-Flint basins. The discussion treats each purpose individually and does not attempt to indicate or analyze the interrelationships between purposes.

Discussions of the existing programs and facilities generally provide inventory data and briefly outline programs in which Federal and State agencies participate. Private and other public interests participate and cooperate in many of the same activities and, in addition, carry out many programs and projects not listed.

The needs and opportunities discussions point out the needs, problems, and general opportunities for meeting the needs. Potential resource development is limited by (1) the needs for each purpose geared to the number of people and the economic level of activity that are expected to prevail in the Apalachicola-Chattahoochee-Flint basins as well as the rest of the Nation, and (2) the physical, financial, and political abilities of the basins to produce the

material goods that are needed. These limits are intended to insure that excess material goods and services will not be produced and developments beyond the capabilities of the basins will not be proposed.

In the discussion of means of meeting the needs, the broad outline of the types of measures that probably could be effectively used is based on the assumption that available resources could be used for each purpose without regard to competition from other purposes. This was done to demonstrate what is possible in meeting the needs of each purpose and to permit treating all purposes on an equal basis when they are combined into a comprehensive plan.

There are no known reports that attempt to portray the entire resources and economy of the Apalachicola-Chattahoochee-Flint basins. However, several reports on specific studies, mainly flood control, navigation, and hydroelectric power and some general information reports that are applicable to the area, are available. Data in these reports were used as supplemental information wherever practicable. A summary of the more important studies is included in Appendix 12, Planning.

SECTION I - FLOOD CONTROL AND PREVENTION

General

Fifty-one percent of the flood plain of the Chattahoochee River is cleared for cropland and pastureland. Clearings of other flood plains total 21 percent for the Flint River, 8 percent for the Flint River tributaries, 3 percent for the Chipola River, and 1 percent for the Apalachicola River. Above the Fall Line the flood plains of the Chattahoochee River are generally flat and narrow and contain excellent agricultural soils. Below the Fall Line the flood plains are high and flooded only by major floods. The flood plain of the Flint River has been developed for agriculture to a minor extent above Albany, Georgia, and to a major extent below Albany. The Flint

River tributaries and the Chipola River have relatively broad flood plains which are mostly forested. The broad flood plain of the Apalachicola River is mostly forested swamp.

In the basins the annual precipitation averages 52 inches and the annual runoff about 15 inches. The period of high runoff is usually from December to May. Some 80 percent of the floods on the Chattahoochee River at West Point, Georgia, occur during the period from December through April, with 25 percent occurring in March. The maximum flood of record at West Point occurred in December 1919 and had a flow of 134,000 cubic feet per second. About 90 percent of the floods on the Apalachicola River at Chattahoochee, Florida, occur dur-

ing the period from December through April. About 35 percent occur in March. The maximum flood of record, with 293,000 cubic feet per second, occurred in March 1929.

The time lapse between a storm and the passage of the flood peak is short for that portion

of the Chattahoochee River above Fort Gaines, Georgia. Therefore, the forecasting and flood warnings must be prompt because time is a critical factor. The timelag on the lower Flint, lower Chattahoochee, and Apalachicola Rivers is measured in days.

TABLE 2.1
Flood Damage Areas

Stream and reach (river mile)	Area inundated by 100-year flood (acres)		
	Cleared	Woods	Total
Apalachicola River			
6 to 108	2,400	244,000	246,400
Chipola River			
19 to 94	1,800	50,000	51,800
Chattahoochee River			
0 to 50	7,200	15,600	22,800
50 to 75	4,900	7,500	12,400
75 to 121	5,700	8,600	14,300
121 to 172	10,000	7,100	17,100
190 to 201	800	700	1,500
201 to 236	6,900	1,700	8,600
236 to 274	4,200	1,000	5,200
274 to 313	4,100	900	5,000
313 to 349	2,200	1,200	3,400
Flint River			
0 to 53	3,400	10,500	13,900
53 to 81	1,400	8,300	9,700
81 to 104	8,700	6,300	15,000
104 to 164	4,300	19,300	23,600
164 to 193	1,300	10,000	11,300
193 to 238	3,300	22,700	26,000
238 to 296	300	9,000	9,300
Spring Creek			
16 to 50	1,100	9,300	10,400
Ichawaynochaway Creek			
1 to 32	700	6,100	6,800
Kinchafoonee Creek			
1 to 52	500	8,900	9,400
Muckalee Creek			
2 to 42	500	8,800	9,300
Total	75,700	457,500	533,200

TABLE 2.2
Timelag Between Heavy Rainfall and Flood Peak
on the Chattahoochee River
(hours)

Place	From Buford Dam
Atlanta	7
West Point	36
Columbus	42
Fort Gaines	66

Existing Facilities and Programs

The United States Weather Bureau makes flood forecasts for the Chattahoochee River in Georgia at Norcross, Atlanta, West Point, Columbus, and Fort Gaines, and in Alabama at Eufaula and Columbia; on the Flint River at Montezuma, Albany, Newton, and Bainbridge, Georgia; and on the Apalachicola River at Jim Woodruff Dam and Blountstown, Florida.

The Buford project of the Corps of Engineers has 637,000 acre-feet of flood storage and materially reduces flood damages as far downstream as West Point, Georgia. Other reservoirs on the Chattahoochee River are primarily for purposes other than flood control and have only incidental effects on floods. Levees provide partial flood protection in West Point and protect the town of Montezuma, Georgia, from the backwater of the Flint River. General planning was completed for channel improvement on Town and Muckalee Creeks, by January 1960, to provide flood protection for Americus, Georgia.

By January 1960, local interests in the basins had submitted applications for development of 16 upstream watershed projects under provisions of Public Law 566, 83d Congress, Watershed Protection and Flood Prevention Act. Three of the projects—Sautee, Palmetto, and Potato Creeks, which are further described in Section VI—had been approved, and 10 flood prevention reservoirs had been constructed and put in operation. These watersheds involve a total of about 187,450 acres. Other land and water conservation programs of State and Federal agencies also contribute to the improvement of the soil hydrologic conditions and the control of runoff and erosion.

The Georgia General Planning Enabling Act of 1957, as amended, and the Florida Zoning and Enabling Act of 1939, as supplemented in 1951 and otherwise amended, authorize studies and planning for flood plain zoning. Federal aid to assist urban areas with comprehensive

FLOOD CONTROL
1960

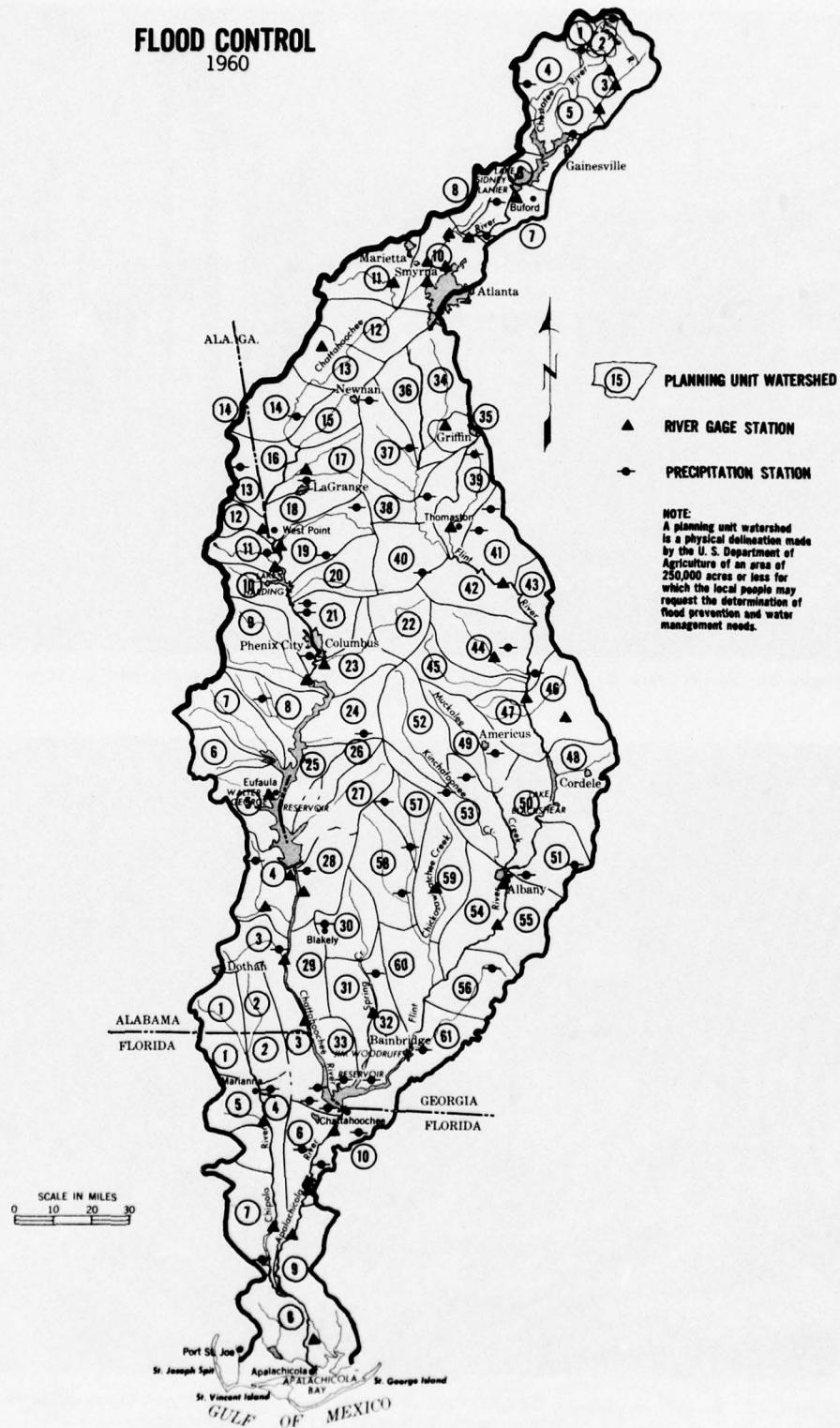


Figure 2-1



Figure 2.2 Floods Have Been a Recurring Problem at West Point, Georgia, and in Other Areas of the Basins.



Figure 2.3 An Area in Atlanta, Georgia, Used as a City Park With No Major Construction in the Flood Plain, Demonstrates Good Flood Plain Management.

TABLE 2.3
Average Annual Mainstream Flood Damages—1959

Stream	River mile	Damages			
		Agricultural	Roads and railroads	Urban	Total
Apalachicola River					
Blountstown, Fla.	5.7 to 107.6	1\$108,800	\$38,800	\$53,800	\$201,400
Chipola River					
Altha, Fla.	18.8 to 94.2	223,100	12,100	3,700	38,900
Chattahoochee River					
Alaga, Ala.	0.0 to 49.5	59,600	4,700	0	64,300
Columbia, Ala.	49.5 to 73.5	9,700	0	0	9,700
W. F. George Dam	75.0 to 121.4	18,500	1,800	0	20,300
Columbus, Ga.	121.4 to 172.2	92,800	2,900	99,800	195,500
West Point, Ga.	190.0 to 201.0	7,000	0	205,400	212,400
West Point, Ga.	201.0 to 236.0	74,400	2,400	0	76,800
Whitesburg, Ga.	236.0 to 274.0	10,300	0	0	10,300
Atlanta, Ga.	274.0 to 312.8	10,500	0	0	10,500
Norcross, Ga.	312.8 to 348.5	4,800	0	0	4,800
	Subtotal	287,600	11,800	305,200	604,600
Flint River					
Bainbridge, Ga.	0.0 to 53.0	6,600	1,400	15,100	23,100
Newton, Ga.	53.0 to 81.0	3,100	200	7,800	11,100
Albany, Ga.	81.0 to 104.0	39,600	4,200	41,100	84,900
Oakfield, Ga.	104.0 to 164.0	16,000	3,200	0	19,200
Montezuma, Ga.	164.0 to 193.5	16,000	1,900	0	17,900
Culloden, Ga.	193.5 to 238.3	21,000	2,400	0	23,400
Molena, Ga.	238.3 to 296.3	4,300	3,200	0	7,500
	Subtotal	106,600	16,500	64,000	187,100
Spring Creek					
Iron City, Ga.	16.0 to 50.2	36,700	1,300	0	8,000
Ichawaynochaway Creek					
Milford, Ga.	0.8 to 31.5	3,400	600	0	4,000
Kinchapookee Creek					
Preston, Ga.	0.6 to 52.0	16,100	4,700	0	20,800
Muckalee Creek					
At mile 40.6	1.7 to 42.1	5,900	1,500	0	7,400
	Total	558,200	87,300	426,700	1,072,200

NOTES: ¹ Includes \$46,600 hunting and fishing damages.
² Includes \$5,300 hunting and fishing damages.
³ Includes \$400 hunting and fishing damages.

planning and zoning is available under Section 701 of the Federal Housing Act. Section 206 of the River and Harbor Act of 1960 authorizes the Corps of Engineers to advise local governing bodies about flood hazards and the need for flood-zoning regulations when such information is requested.

Needs and Opportunities

The most serious flood problems are in the headwater areas in the Blue Ridge and Piedmont provinces and on the mainstreams of the

major rivers. Watershed projects encompassing 7.7 million acres are considered to need project action. Projects located on lands aggregating about 6.6 million acres may be feasible for installation by the year 2000.

In 1959, flood damages on the mainstreams and principal tributaries of the basins averaged \$1,072,000 annually. Some 60 percent of these damages occur to agricultural property and transportation facilities and 40 percent to urban property. By the year 2000, an estimated 54 percent of the damages are expected to occur to

agricultural property and transportation facilities and 46 percent are expected to occur to urban property.

Average annual mainstream flood damages are expected to increase to \$2,802,200 by the year 2000, and flood damages of \$2,414,000 on the small watersheds should remain about the same in the future, if additional flood control or flood plain management is not provided.

Means of Meeting the Needs

Measures for alleviating future flood problems could include flood forecasting, flood plain management with zoning, reservoir storage, channel improvements, and levees.

Flood forecasting should provide as much time as possible for the operation of reservoirs and for warning people of expected flood stages. The present system appears adequate if minor

changes such as telemetered gages are provided.

Flood plain zoning appears desirable for deterring possible residential and industrial development in areas subject to flooding. Local flood hazards should be brought to the attention of the people so that future buildings and improvements will not be located in the flood plains.

Installation of channel-type project works in upstream watersheds could provide direct benefits from flood prevention and drainage; in addition, land-use adjustments which are necessary to conserve and more effectively utilize and develop the land and water resources of the basins would be encouraged.

Various plans of improvement for levees, channels, reservoirs, and diversion of floodwater need to be considered for the Apalachicola-Chattahoochee-Flint basins.

SECTION II - WATER SUPPLIES

General

The development and protection of safe and adequate water supplies necessary for the growth of the Apalachicola-Chattahoochee-Flint basins are an important part of the public health program. The abundance of satisfactory sources makes possible the quantities of water needed for optimum development. Treatment, chlorination, and continuous surveillance of the water supplies by the health departments are required to safeguard water quality and public health.

Ground water is limited and often difficult to locate in the Blue Ridge province, more abundant in the Piedmont province, and plentiful in the Coastal Plain. Ground water quality is generally good and meets the chemical requirements of the recommended drinking water standards, except in a few local areas where treatment should be provided.

In 1960, a number of the municipal and industrial water supplies were obtained from surface sources. The surface waters are consistently suitable for municipal and industrial use, and, with a minimum of treatment, can provide excellent water supplies.

The Farmers Home Administration provides assistance for group development of rural water

supplies, and municipalities may obtain assistance from the Housing and Home Finance Agency.

Existing Facilities and Programs

Domestic Water Supplies

Domestic water supplies are defined as private supplies constructed to serve a single family. In 1960, an estimated 63,000 domestic supplies served a rural population of approximately 284,000 people. Based on a limited inventory, water use in the rural home, excluding water used for stock and irrigation purposes, was estimated to average 50 gallons per person per day. About 70 percent of the domestic water supplies were equipped with pressure systems. Approximately 60 percent of the wells did not meet recommended standards of sanitary construction and 30 percent had an inadequate source of supply, or the source did not meet accepted health standards.

Approximately 22,000 rural homes were served by drilled wells, 30,000 by dug wells, 4,000 by driven wells, and 3,000 by bored wells. Nearly 4,000 rural homes obtain their water supplies from springs.

WATER SUPPLIES 1960

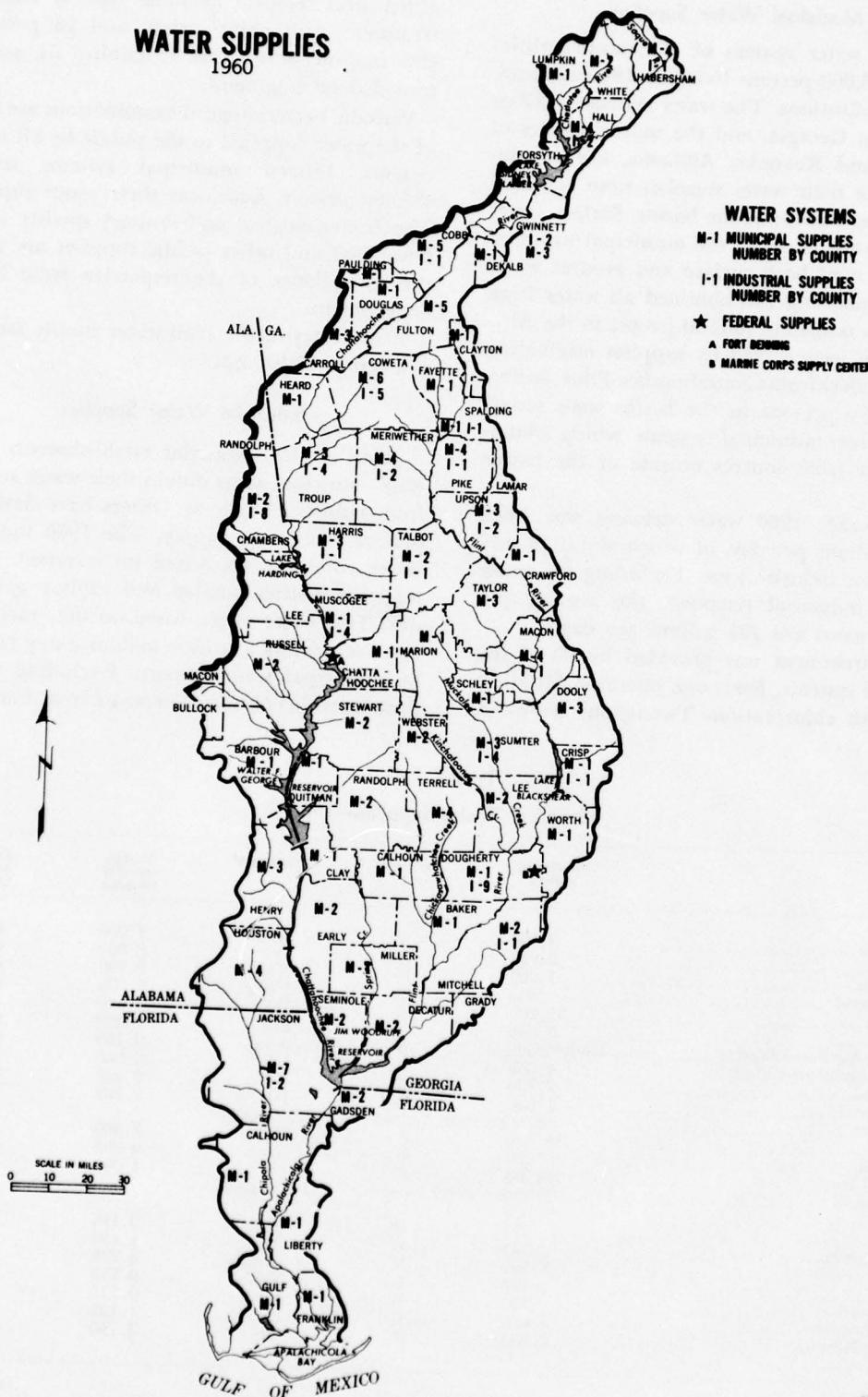


Figure 2.4

Municipal Water Supplies

In 1960, water systems of 151 municipalities served 1,645,000 persons living in 184 communities and institutions. The water systems of Clayton County, Georgia, and the municipalities of Lafayette and Roanoke, Alabama, are not included since their water supplies were obtained from sources outside of the basins. Surface water was the source of 40 of the municipal supplies. Five cities used both surface and ground water and the remaining 106 obtained all water from wells. Approximately 308,500 people in the Altamaha basin were served by supplies originating in the Apalachicola-Chattahoochee-Flint basins. Some 10,000 persons in the basins were served by the three municipal systems which obtain their water from sources outside of the basins area.

The average 1960 water demand was 199.2 million gallons per day, of which about 18 percent was for industrial use. Excluding the water used for industrial purposes, the average per capita demand was 101 gallons per day.

Water treatment was provided by 90 of the municipal systems. Forty-one operated filtration plants with chlorination. Twenty-one provided

either iron removal or some type of chemical treatment with chlorination, and 28 provided chlorination only. The remaining 61 systems provided no treatment.

Periodic bacteriological examinations are made of the water supplied to the public by all of the systems. Fifteen municipal systems serving 480,400 persons fluoridate their water supplies. The bacteriological and sanitary quality of the municipal and other public supplies are under the surveillance of the respective State health departments.

A summary of the 1960 water supply facilities is given in Table 2.4.

Industrial Water Supplies

Some of the industrial establishments in or near municipal areas obtain their water supplies from municipal systems. Others have developed private sources of supply. The 1960 industrial water consumption, based on a survey of the major industries, totaled 59.4 million gallons a day. This water usage, based on the yearly average, includes 35.7 million gallons a day supplied by municipal water systems. Excluding the industries which obtain their water from municipal

TABLE 2.4
Municipal Water Supplies—1960

Municipality	Population served	Source ¹	Treatment ²	Design capacity (m.g.d.)	Average demand (m.g.d.)
Alabama					
Abbeville	2,520	W	None	1.000	0.125
Ashford	2,000	W	D	0.500	0.120
Columbia	1,000	W	None	0.790	0.100
Cottonwood	500	W	None	0.570	0.030
Dothan	35,200	W	DV	5.140	4.000
Eufaula	8,350	S	DP	1.080	0.500
Eufaula Air Force Station	Undetermined	W	None	0.100	0.012
Fairfax (unincorporated)	4,000	S	DP	2.000	0.320
Headland	2,800	W	None	0.430	0.200
Hurtsboro	1,040	W	DP	0.192	0.064
Lafayette	(obtains water outside of A-C-F basins)				
Lanett ³	18,530	S	DPV	3.300	1.860
Newville	500	W	None	0.095	0.030
Phenix City	26,500	S	DP	4.000	1.600
Roanoke	(obtains water outside of A-C-F basins)				
Florida					
Alford	375	W	None	0.118	0.050
Apalachicola	3,090	W	AD	1.152	0.260
Blountstown	2,500	W	None	0.778	0.200
Bristol	497	W	None	0.216	0.045
Campbellton	350	W	None	0.216	0.040
Chattahoochee	3,676	W	D	1.123	0.200
State Hospital	7,300	S	DP	3.750	2.150

(continued)

TABLE 2.4—Continued

Municipality	Population served	Source ¹	Treatment ²	Design capacity (m.g.d.)	Average demand (m.g.d.)
Cottondale	950	W	None	0.173	0.100
Greenwood (unincorporated)	105	W	None	0.020	0.010
Malone	676	W	None	0.518	0.070
Marianna	7,135	W	DP	3.456	0.630
Florida School for Boys	950	W	D	0.792	0.250
Sneads	1,355	W	D	0.144	0.110
Apalachee Correct. Inst.	600	W	D	2.016	0.200
Hospital Prison Farm	235	W	None	1.440	0.030
Wewahitchka	945	W	D	0.324	0.100
Georgia					
Albany ⁴	61,300	W	DV	24.000	6.521
Fairfield	175	W	D	0.335	0.010
Kalmah-Malone	1,250	W	D	1.150	0.075
Radium Springs	998	W	D	2.000	0.060
Alpharetta	1,420	W	None	0.250	0.200
Americus	13,872	W	D	4.000	1.750
Arlington	1,400	W	None	1.300	0.085
Arneo Village (unincorporated)	800	W	None	0.550	0.030
Atlanta ⁵	609,500	S	DP	92.000	73.742
Austell	2,267	S	DP	0.500	0.365
Baconton	550	W	D	Undetermined	0.021
Bainbridge	10,210	W	D	9.400	1.500
Blakely	5,100	W	None	2.600	0.800
Brinson	275	W	None	Undetermined	0.019
Bronwood	400	W	None	0.360	0.037
Buena Vista	1,870	W	AD	0.980	0.193
Buford ⁶	4,768	S	DP	0.520	0.383
Butler	1,546	W	None	0.500	0.067
Byromville	384	W	DP	0.090	0.030
Camilla	4,813	W	D	6.000	1.000
Clarksdale (unincorporated)	440	S	DP	0.500	0.067
Clarkston	1,408	W	None	4.500	0.130
Clarkesville	2,052	S	DP	0.360	0.182
Cleveland	1,157	W	D	0.500	0.080
Cobb County-Marietta Water Authority ⁷	80,000	S	DPV	16.000	8.687
Colquitt	1,520	W	None	0.650	0.090
Columbus	139,279	S	DP	36.000	16.310
Concord	365	S	D	0.177	0.015
Cordele	11,309	W	DV	5.600	1.000
Cornelia	3,536	SW	DP	0.140	0.150
Damascus	300	W	None	2.150	0.018
Dawson	5,100	W	None	1.750	0.350
DeKalb County ⁸	163,700	S	DPV	33.000	33.000
Demorest	1,829	W	D	0.160	0.100
Donalsonville	2,535	W	D	0.575	0.250
Paradise Acres	105	W	None	0.040	0.008
Douglas County	4,350	S	DP	2.500	0.600
Douglasville	4,462	S	DP	0.750	0.450
East Newnan (unincorporated)	650	W	None	Undetermined	0.018
East Point ⁹	68,229	S	DP	8.000	6.720
East Thomaston	2,300	S	DP	3.000	2.990
Edison	1,230	W	None	1.440	0.150
Ellaville	955	W	AP	0.155	0.065
Fayetteville	1,415	S	ADP	0.144	0.075
Flowery Branch	800	W	None	0.080	0.040
Fort Benning	80,000	S	P	8.000	5.400
Fort Gaines	1,380	W	None	0.720	0.138
Franklin	610	W	P	0.240	0.061
Gainesville ¹⁰	30,953	S	DPV	6.000	3.700
Georgetown	350	W	None	0.186	0.030
Grantville	1,183	W	None	0.370	0.100
Greenville	1,320	S	DP	0.200	0.100
Griffin	22,000	S	DPV	7.000	4.300
Gwinnett County ¹¹	19,253	S	DP	6.500	1.636
Habersham (unincorporated)	370	S	DP	0.144	0.020
Hamilton	396	S	DP	0.100	0.017
Hampton	1,210	W	D	0.160	0.120
Helen	225	WS	F	0.086	0.015

(continued)

TABLE 2.4—Continued

Municipality	Population served	Source ¹	Treatment ²	Design capacity (m.g.d.)	Average demand (m.g.d.)
Hiram	358	W	D	0.130	0.013
Hogansville	3,894	S	DPV	0.600	0.400
Ideal	357	W	ADF	0.100	0.012
Iron City	298	W	None	0.065	0.030
Jonesboro ¹²	3,054	W	D	0.250	0.099
LaGrange	25,132	S	DVP	4.000	1.950
Leary	840	W	None	0.420	0.050
Leesburg	750	W	None	0.930	0.075
Leslie	494	W	None	0.144	0.030
Lumpkin	1,350	W	ADP	0.430	0.075
Manchester	4,315	S	DPV	1.000	0.417
Scenic Heights	150	W	D	0.030	0.009
Marine Corps Supply Center	2,593	W	D	6.630	0.870
Marshallville	1,308	W	A	0.720	0.065
Meansville	212	W	None	0.087	0.008
Molena	284	W	None	0.087	0.100
Montezuma	3,744	W	ADPV	2.500	0.500
Morgan	290	W	None	0.722	0.017
New Holland (unincorporated)	1,150	S	D	0.360	0.100
Newnan	12,169	S	DPV	3.000	1.200
Newton	529	W	None	1.000	0.038
Oglethorpe	1,150	W	AD	0.420	0.050
Pacolet (unincorporated)	630	W	D	0.210	0.063
Palmetto	1,486	S	DP	0.400	0.060
Parrott	280	W	None	0.144	0.040
Pinehurst	462	W	None	0.144	0.018
Pine Mountain	930	S	None	0.100	0.044
Pine Mountain Valley (unincorporated)	600	SW	None	Undetermined	0.140
Plains	615	W	DF	0.072	0.037
Potterville (unincorporated)	150	W	None	0.200	0.001
Powder Springs	1,722	W	None	0.650	0.085
Preston	250	W	None	0.180	0.025
Reynolds	1,127	W	None	0.360	0.055
Richland	1,460	W	D	0.722	0.200
Roberta	690	W	None	0.096	0.041
Roopville	212	W	None	0.050	0.002
Roswell	3,983	S	DP	0.700	0.300
Sargent (unincorporated)	800	W	D	0.200	0.035
Sasser	388	W	None	0.300	0.030
Senoia	500	W	None	0.230	0.030
Shellman	1,190	W	None	Undetermined	0.071
Smithville	700	W	D	0.220	0.042
Sugar Hill ¹³	1,175	W	D	0.070	0.050
Suwannee	450	W	None	0.110	0.018
Talbotton	1,223	W	None	0.175	0.054
Thomaston	9,340	S	DP	2.000	1.000
Subdivisions—four	1,800	W	None	Undetermined	0.100
Vienna	2,119	W	D	2.400	0.212
Villa Rica	2,472	S	DP	1.500	0.350
Warm Springs	650	S	DP	2.600	0.040
Warm Springs Foundation	350	S	DP	0.320	0.160
Warwick	449	W	None	0.200	0.040
Waverly Hall	690	W	ADF	0.090	0.042
Weston	50	W	None	0.070	0.003
West Point	4,610	S	DPV	2.180	0.552
Whitesburg	541	W	None	Undetermined	0.025
Woodbury	1,230	S	D	0.150	0.070
Woodland	720	W	D	0.100	0.018
Yatesville	354	W	None	0.110	0.010
Zebulon	653	WS	DP	0.500	0.054

NOTES: ¹ W = well; S = surface. ² A = aeration; D = disinfection; F = filters; P = purification; V = fluoride adjustment. ³ Serves adjacent areas including Langdale, Shawmut, and Riverview. ⁴ Serves Turner Air Force Base. ⁵ Serves adjacent areas including Fairburn, Forest Park, Hapeville, Union City, Fort McPherson, and Atlanta General Depot. ⁶ Serves Rest Haven. ⁷ Serves Acworth, Kennesaw, Marietta, Smyrna, and Dobbins Air Force Base. ⁸ Serves Avondale Estates, Chamblee, Decatur, Doraville, North Atlanta, and Pine Lake. ⁹ Serves College Park. ¹⁰ Serves adjacent areas including Chicopee and Clermont. ¹¹ Serves Berkeley Lake, Dacula, Duluth, Norcross, Lawrenceville—0.167 million gallons per day, Loganville, and Lilburn. ¹² Also served by the Clayton County Water System—0.066 million gallons per day. ¹³ Water demand supplemented during summer with 0.200 million gallons per month from Gwinnett County Water Company.

systems, 22 of those surveyed obtained water from surface sources, 4 industries used both well and surface water, and 26 obtained their entire supply from wells. No industries indicated that their 1960 sources of supply were inadequate.

Industrial water uses are generally nonconsumptive and no attempt was made to determine the total consumptive use. Where data are not available to the contrary, it was assumed that a volume equal to the water used is discharged as industrial waste.

Needs and Opportunities

Domestic Water Supplies

In 1960, many of the wells were improperly sealed, uncovered, without pumps, or had pumps which were not self-priming. Improper construction and the lack of proper equipment make wells vulnerable to bacteriological contamination and turbidity. The drilled wells, for the most part, met sanitary standards of construction and were equipped with pressure systems. For sanitary security all wells need to be properly covered, sealed, and equipped with satisfactory pumps and pressure systems. Many benefits are derived from an adequate pressurized water supply.

Some of the ground water supplies have objectionable amounts of sulfur, iron, and hardness. It is possible to remove most of these undesirable characteristics with standard treatment procedures.

By 1975, the average water use by the rural population is expected to increase to 70 gallons per capita per day. By 1975, an estimated 256,400 persons are expected to be served by domestic water supplies and will require 17.9 million gallons of water per day. By the year 2000, the per capita water use is expected to increase to 100 gallons per day and the population to be served by domestic water supplies is estimated at 229,000 people. Water requirement is expected to total 23 million gallons a day. Domestic water needs can be adequately served by wells in most parts of the basins. In a few headwater areas surface supplies may have to be developed.

Municipal Water Supplies

Future water supply requirements have been

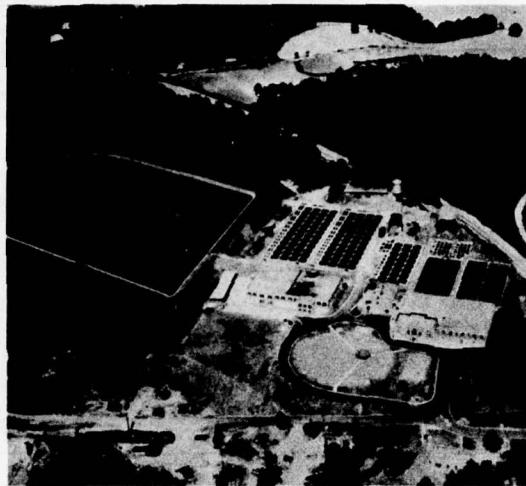


Figure 2.5 *Waterworks at Columbus, Georgia, Are Typical Modern Facilities.*

based on population projections and on an estimated per capita water use averaging 150 gallons per day in 1975 and 200 gallons per day in 2000. Ground water resources will continue to be used in the lower part of the basins where ground water is adequate in quantity and where supplies can be economically developed for the expected future water needs. Surface water will be used to augment the ground water sources, particularly in the Blue Ridge and Piedmont areas.

Adequate quantities of surface water are available throughout the entire area and should be developed for future needs where ground water is limited in quantity, or where the additional development of ground water may increase the possibility of salt-water intrusion.

It is expected that most of the subdivisions with separate water systems in 1960 will incorporate with adjacent cities by 1975. Additional countywide water systems will be developed to serve nonurban population concentrations in areas where ground water sources are limited and community surface water supplies can be developed as economical alternatives to individual wells. In densely populated areas, the development of community supplies will be more economical than small well construction.

Needed water system improvements were reported by 95 municipalities in 1960. In addition, other enlargements may be required to assure adequate facilities and supplies for the estimated

TABLE 2.5
Municipal Water Facility Needs

Population	Number of places	Number of places requiring new or additional			
		Source or treatment	Elevated storage	Distribution system	
1960 to 1975					
Under 2,500	189	65	27	56	
2,500 - 10,000	22	14	10	20	
Over 10,000	21	11	15	20	
1975 to 2000					
Under 2,500	268	16	3	35	
2,500 - 10,000	26	14	12	19	
Over 10,000	34	30	30	33	
Summary					
State	Year	Total number of places	Number of places requiring	Population served ³ (1,000)	Water use (m.g.d.)
Alabama	1975	12	10	174	26
	2000	12	4	245	49
Florida	1975	16	12	42	6
	2000	18	7	60	12
Georgia	1975	104	68	1,772	340
	2000	98	49	3,422	884
Total	1975	132	90	1,988	372
	2000	128	60	3,727	945

NOTES: ¹ Includes 33 places with population of less than 700.

² Includes 20 places with population of less than 700.

³ Excludes 500,000 persons in 1975 and 1 million persons in 2000 living outside the basins.

growth and development of the communities. By 1975, an estimated 1,988,000 persons living in the basins are expected to be served by 132 municipal systems. The total water demand for the year 1975 is estimated at 372 million gallons a day including 74 million gallons per day supplied to persons living outside the basins. Ninety of the municipal systems will need new sources of supply or enlargement of existing sources and/or treatment. Elevated storage tanks will soon be needed by 52 municipalities and 96 of the distribution systems will need to be extended. Similar improvements will be needed between 1975 and the year 2000 to insure adequate facilities to provide 745 million gallons of water a day, to 3,727,000 persons living in the basins and an additional 200 million gallons per day for 1 million people living outside the basins area.

By the year 2000, water demands of the cities in the Atlanta metropolitan area will be more than twice the amount of the recorded 7-day

low flows in the Chattahoochee River—the only convenient source of supply. The demands will also be about 30 percent more than the assured minimum flow provided by release from Lake Lanier under terms of the authorizing legislation. The cities have no financial interest in the reservoir for municipal water supply purposes and no arrangements have been made for the purchase of stored water. Low-flow periods are already creating some diversion problems. As water demands increase, these problems will intensify. Eventually, the needed water will not be available under present operating arrangements.

Industrial Water Supplies

Proper development of surface and ground water sources will provide adequate water supplies for continued industrial growth. Estimated water requirements for the year 1975 total 48 million gallons a day. Industrial water demand

for the year 2000 is expected to increase to approximately 56 million gallons a day.

Means of Meeting the Needs

Domestic Water Supplies

To provide adequate and properly constructed pressurized water systems will necessitate construction of new drilled wells, improvements to existing wells, and the installation of additional pressure systems. Drilled wells are preferable to other types of well construction. Assuming that the needed wells are drilled prior to 1975, a continued maintenance and rehabilitation program will assure adequate water for the estimated total of 51,000 domestic water supplies needed for the year 2000. In some areas, however, where ground water is limited, community systems may be needed to replace inadequate well supplies.

Local health departments can assist by placing additional emphasis on the rural supply program by providing information and consultation to the owners. The selection of a good source, proper sanitary construction, and the installation of good pumps will provide protection and upgrade the domestic water supply. For safety, supplies must be checked for bacteriological quality. Without leadership the upgrading of the domestic water supplies will be slow.

Municipal Water Supplies

To insure that the expected municipal water supply needs are met, a continued study and educational program will be required for each municipality. This will be difficult in smaller towns, although technical assistance can be obtained from Federal, State, and private sources.

Consulting engineers can design facilities to meet the needs using readily available equipment and following standard waterworks practices. There are no apparent unusual supply, development, or treatment problems. Ground waters of the basins usually can be developed more economically than other sources, particularly in the Coastal Plain. Where ground water is limited, surface supplies could be developed to supplement the supply. Surface water will be the major source of supply for the Blue Ridge and Piedmont areas.

For the Atlanta metropolitan area, additional storage to hold and regulate present unneeded floodflows could be obtained in a reservoir above Lake Lanier. Such a reservoir would have the advantage of being far enough upstream to serve developing population centers outside or on the peripheries of the metropolitan area that are too high for convenient service from the metropolitan systems. Needed storage for Atlanta could also be obtained from a reservoir on the Chattahoochee River below Buford Dam at the Cedar Creek or other suitable site.

Industrial Water Supplies

The expansion of facilities to provide adequate water supplies for normal growth of existing industries and development of supplies for new industries will be required prior to 1975. An additional expansion will be needed prior to 2000. The needed facilities will include new wells, new surface water intakes, treatment plants, softening facilities, and other water handling equipment. No significant industrial water supply problems from the standpoint of quantity or quality are expected.

SECTION III - NAVIGATION

General

The principal navigation features in the basins are the improved barge routes to Columbus, Phenix City, and Bainbridge made possible by Jim Woodruff, Columbia, and Walter F. George Dams and Locks. These routes connect river terminals with Gulf ports via the Gulf Intracoastal Waterway. Above Columbus and Phenix

City on the Fall Line, navigation development would be more difficult because of the steep stream gradient and because there are several power dams which have no provision for navigation locks in their design. Similar conditions occur above Albany, although there are fewer dams and the stream gradient is much less pronounced.

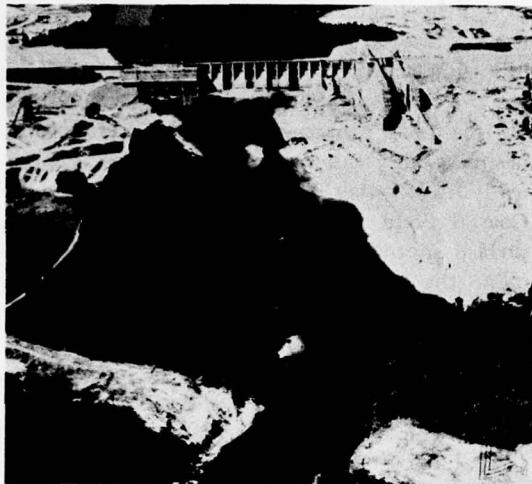


Figure 2.6 *Walter F. George Lock and Dam, Under Construction in 1962, Provides an Important Link in the Chattahoochee River Development.*

Existing Facilities and Programs

A channel with minimum dimensions of 9 feet deep and 100 feet wide exists from the mouth of the Apalachicola River, through the 82- by 450-foot lock at Jim Woodruff Dam to Columbia, Alabama, on the Chattahoochee River and to Bainbridge, Georgia, on the Flint River. An extension of the 9-foot project to Columbus, Georgia, is scheduled for completion in 1963. Two additional 82- by 450-foot navigation locks are included in the project, one each at Columbia and Walter F. George Dams.

A 40-mile section of the Gulf Intracoastal Waterway crosses the southern edge of the basins. For one-half of this distance the waterway follows inland tidal streams and dredged cuts. The portion east of the town of Apalachicola, Florida, has a marked channel in the shallow waters of Apalachicola Bay. Minimum channel dimensions are 12-foot depth and 125-foot width.

There are terminal facilities at Chattahoochee, Florida; Bainbridge and Columbus, Georgia; and Columbia and Phenix City, Alabama. A gravel company owns a small loading dock at Chattahoochee. Bainbridge has the following facilities:

(1) A privately owned timber pier extending 82 feet from the shoreline, with pile clusters 200 feet apart, is available for handling only asphalt. Transfer between barges and storage tanks is

by three 8-inch pipelines and one 3-inch steam line. Storage capacity totals 87,000 barrels.

(2) The Georgia Ports Authority operates a concrete wharf 400 feet long with 26,000 square feet of adjacent enclosed warehouse space and considerable open storage. This public terminal is used for handling both bulk and general cargo and is served by rail and truck.

(3) A privately owned T-head wood-pile wharf with five dolphins handles butane and propane gases only. Propane gas is transferred from barges to tank storage with a 1,440,000-gallon capacity through one 6-inch and one 4-inch pipeline.

(4) A privately owned timber and wood pile pier with two dolphins is used for unloading grain from barges. The grain is transferred by means of two 18-inch blower pipes to storage in a 10-silo elevator.

At Columbus, Georgia, the inland barge port of the Georgia Ports Authority has two berths totaling 400 linear feet, a 30,000-square-foot transit shed, handling equipment, and rail and truck facilities.

At Columbia, Alabama, a privately owned timber pier with mooring dolphins is used for handling and transfer of refined petroleum products. Facilities include a transfer pipeline and a storage tank farm. At Columbia, the State of Alabama also has provided an open pile concrete wharf 200 feet long and 52 feet wide for handling general cargo.

At Phenix City, Alabama, the State of Alabama is constructing a 66- by 70-foot concrete dock on steel pilings and a 24,000-square-foot warehouse with loading platforms and offices. Similar facilities are being provided at Eufaula, Alabama.

Numerous privately owned docks, slips, boat rental establishments, and other facilities for small boats exist along the waterways. Marinas for recreational craft are located at Chattahoochee and Bainbridge. At Apalachicola, Florida, there are extensive establishments for serving commercial fishing craft, recreational boats, and barges.

In anticipation of increased traffic after completion of the extension of the 9-foot project, plans are being developed for additional terminal construction. These include general pub-

NAVIGATION
1960

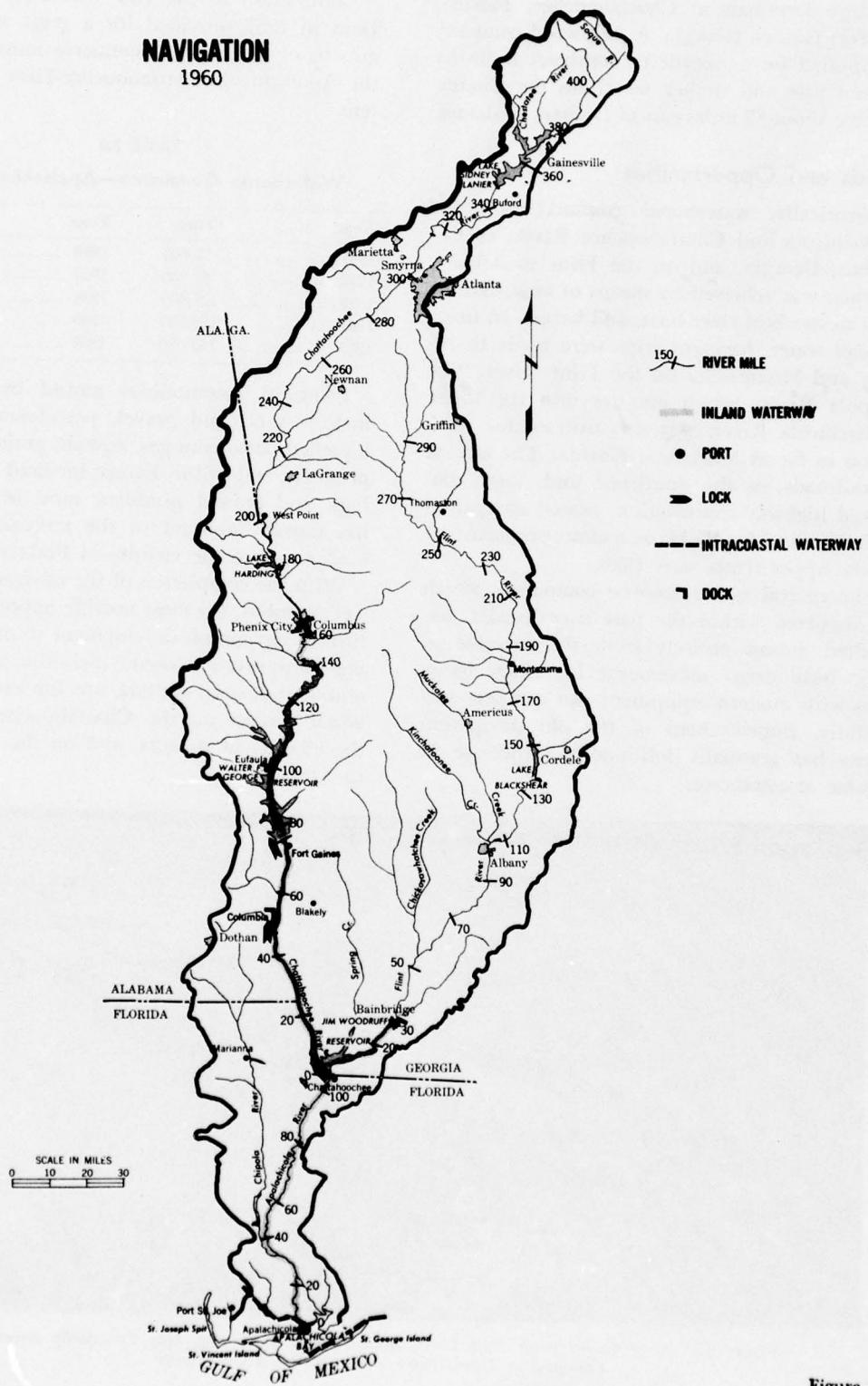


Figure 2.7

lic cargo terminals at Chattahoochee, Florida, and Fort Gaines, Georgia. A pulpwood company has applied for a permit to construct a 30- by 100-foot pile and timber wharf on the Chattahoochee about 17 miles east of Dothan, Alabama.

Needs and Opportunities

Historically, waterborne commerce on the Apalachicola and Chattahoochee Rivers to Columbus, Georgia, and on the Flint to Albany, Georgia, was achieved by means of very shallow draft stern-wheel river boats and barges. In times of high water, frequent trips were made to Albany and Montezuma on the Flint River. The Chipola River, which empties into the lower Apalachicola River, was also utilized for navigation as far as Marianna, Florida. The advent of railroads in the Southeast and, later, improved highway construction, caused navigation to decline and finally become almost nonexistent on the upper rivers after 1920.

The revival of waterborne commerce, which has occurred within the past two decades, has resulted almost entirely from the increase in large bulk cargo movements in which barge lines with modern equipment can compete successfully. Improvement of the old navigation routes has gradually followed the increase in volume of commerce.

Completion of the Jim Woodruff Lock and Dam in 1957 provided for a great increase in growth of waterborne commerce movements on the Apalachicola-Chattahoochee-Flint River system.

TABLE 2.6
Waterborne Commerce—Apalachicola River

Year	Tons	Year	Tons
1951	78,600	1956	147,000
1952	87,700	1957	221,000
1953	125,000	1958	340,000
1954	123,000	1959	387,000
1955	142,000	1960	405,000

Principal commodities moved by waterway include sand and gravel, petroleum products, liquefied petroleum gas, asphalt, grain and grain products, and sulfur. Except for sand and gravel, logs, and animal products, most of the traffic has moved inbound to the terminal at Bainbridge and to the vicinity of Blakely, Georgia.

With the completion of the navigable channel to Columbus, the most notable opportunities for further navigation development to meet increasing transportation needs, including those of potential industrial centers, are for extending the 9-foot project on the Chattahoochee River to the vicinity of Atlanta, and on the Flint River to Albany.

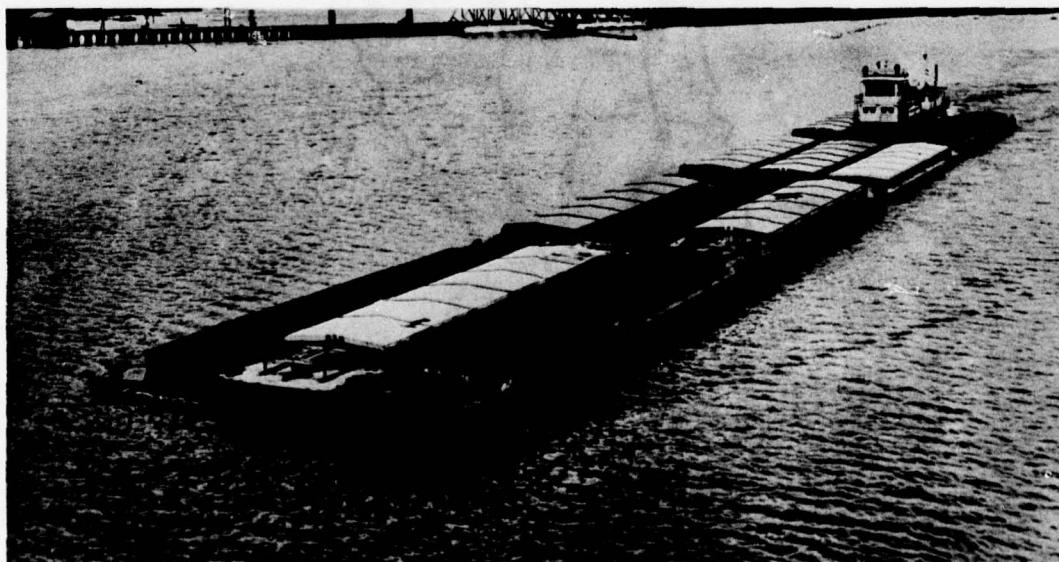


Figure 2.8 Barge Lash-Up for Bulk Cargo Movement, a Scene that May Eventually Become Common in Open-Water Areas of the A-C-F Basins.

TABLE 2.7
Prospective Commerce and Savings by Reaches
(thousands)

Year and item	Existing project*	Columbus to Atlanta	Bainbridge to Albany	Total project	Total less existing project
Current					
Tons	1,026	1,228	596	2,850	1,824
Savings	\$1,764	\$1,868	\$331	\$3,943	\$2,179
1975					
Tons	2,107	2,849	1,303	6,259	4,152
Savings	\$3,480	\$4,199	\$731	\$8,410	\$4,930
2000					
Tons	4,415	5,685	2,804	12,904	8,489
Savings	\$7,704	\$8,573	\$1,608	\$17,885	\$10,181

* Assuming project completed and operating.

TABLE 2.8
Prospective Commerce and Savings by Ports
(thousands)

Location	1960		1975		2000	
	Tons	Savings	Tons	Savings	Tons	Savings
Albany	355	\$212	752	\$467	1,588	\$1,023
Atlanta	1,085	1,763	2,582	4,032	5,128	8,222
Bainbridge	271	644	513	1,241	1,138	3,097
Columbia	152	328	315	687	677	1,567
Columbus-Phenix City	279	458	485	783	954	1,455
Eufaula	116	150	208	272	431	570
West Point	108	61	197	113	409	235
Scattered landings	484	327	1,207	815	2,579	1,716
Total	2,850	3,943	6,259	8,410	12,904	17,885

Extension of navigation upstream on the Chattahoochee and Flint Rivers is physically possible. Increased industrialization of the area, the completion of the Chattahoochee-Flint River navigation project, and the probable construction of the Cross-Florida Barge Canal are expected to increase the waterborne traffic to and from the inland ports and on the Intracoastal Waterway in the basins. The river systems are expected to serve increasing amounts of recreational traffic.

Current potential traffic for each of the reaches, if the waterways existed, was determined by a canvass of shippers and receivers of freight in the respective tributary areas, supplemented by studies of available statistics on production and

consumption within those areas. The portion of the potential traffic which could move by water at a savings in transportation costs was then determined by a comparative rate analysis, considering other means of transportation. By use of multipliers developed from economic studies, projections of prospective traffic for the years 1975 and 2000 were made and savings estimated. In the same manner projections of prospective traffic at the various inland ports were developed.

Means of Meeting the Needs

Providing a channel on the Chattahoochee River from the head of navigation at Columbus to the vicinity of Atlanta would involve construction of locks at four existing power dams

and one proposed flood control dam, replacement of four existing low-head power dams with two locks and dams, and construction of two locks and dams upstream from the proposed West Point flood control dam. Project depth would be 9 feet, the minimum channel width 100 feet, and lock chamber dimensions would be 82 feet by 450 feet, the same as the existing project. One of the locks, at Bartletts Ferry, would be a double-lift structure for overcoming the 121-foot difference in pool elevations. Between Columbus and Atlanta the total lift would be 578 feet and the length of the waterway extension would be 135 miles. In addition to lock and dam construction, considerable dredging, snagging, and rock excavation would be necessary. Also required would be alterations to 14 railroad and highway bridges to provide navigation clearances, relocations or adjustments to numerous State and county roads and crossings over tributary streams, and changes in 12 pipeline crossings and many other utility lines. Operation of existing power dams and their pool levels would remain unchanged except at the

four low-head dams which would be replaced.

Another possible means of meeting navigation traffic needs would be to extend 9-foot navigation on the Flint River from Bainbridge to Albany. The most practicable plan appears to be two dams with locks plus channel improvement to provide suitable alignment for barge traffic. Locks would have chamber dimensions 82 feet by 450 feet and lifts totaling 76 feet. Relocation of two highway and two railroad bridges across the river would be required to provide suitable navigation clearances. It would be necessary to relocate about 5 miles of State highways in the lower pool, but other utility relocations would be minor. An item of considerable uncertainty would be the foundation treatment that might be necessary to prevent excessive reservoir leakage through the soft, cavernous limestone underlying the region.

With or without new navigation routes, projected increases of prospective traffic on the existing project by 2000 will require additional terminals and probable extensions of existing terminal facilities.

SECTION IV – RECLAMATION, IRRIGATION, AND DRAINAGE

General

Drainage is the principal method of reclaiming land for agriculture, forestry, or other uses in the Southeast, and the terms reclamation and drainage are considered as synonymous in this Report. In this region, irrigation properly used to supplement rainfall provides the opportunity for expanding farming operations and stabilizing income.

Existing Facilities and Programs

Irrigation

Approximately 18,000 acres were irrigated in 1960 principally by sprinkler systems. Some acreages were irrigated by furrow and subsurface methods. Some 345 farms out of 34,500 in the basins had irrigation systems.

Around 85 percent of the irrigated land was in Georgia, 10 percent was in Florida, and 5 percent was in Alabama. Three-fourths of the total acreage irrigated was in the Upper Coastal Plain, over 20 percent was in the Piedmont

province, and the remainder was in the Blue Ridge province and Lower Coastal Plain. Mitchell and Decatur Counties, Georgia, accounted for nearly one-fourth of all the irrigated land. The irrigated lands consisted of over 3,000 acres each of vegetables and pasture; about 2,300 acres each of corn, tobacco, grass and hay, and other field crops; 1,500 acres of orchard; and 800 acres of miscellaneous crops.

Irrigating this acreage required about 18,000 acre-feet of water. About half of this amount, or 9,300 acre-feet, was supplied from ponds; 5,900 acre-feet were supplied from streams; and 2,800 acre-feet were supplied from wells. Twice the amount of water used from ponds was available for irrigation from the 6,700 farm ponds existing in 1960.

Technical information, cost sharing, and loan assistance from various U. S. Department of Agriculture agencies were used by farmers.

Drainage

Drainage facilities have been installed on approximately 71,000 acres of cropland and pas-

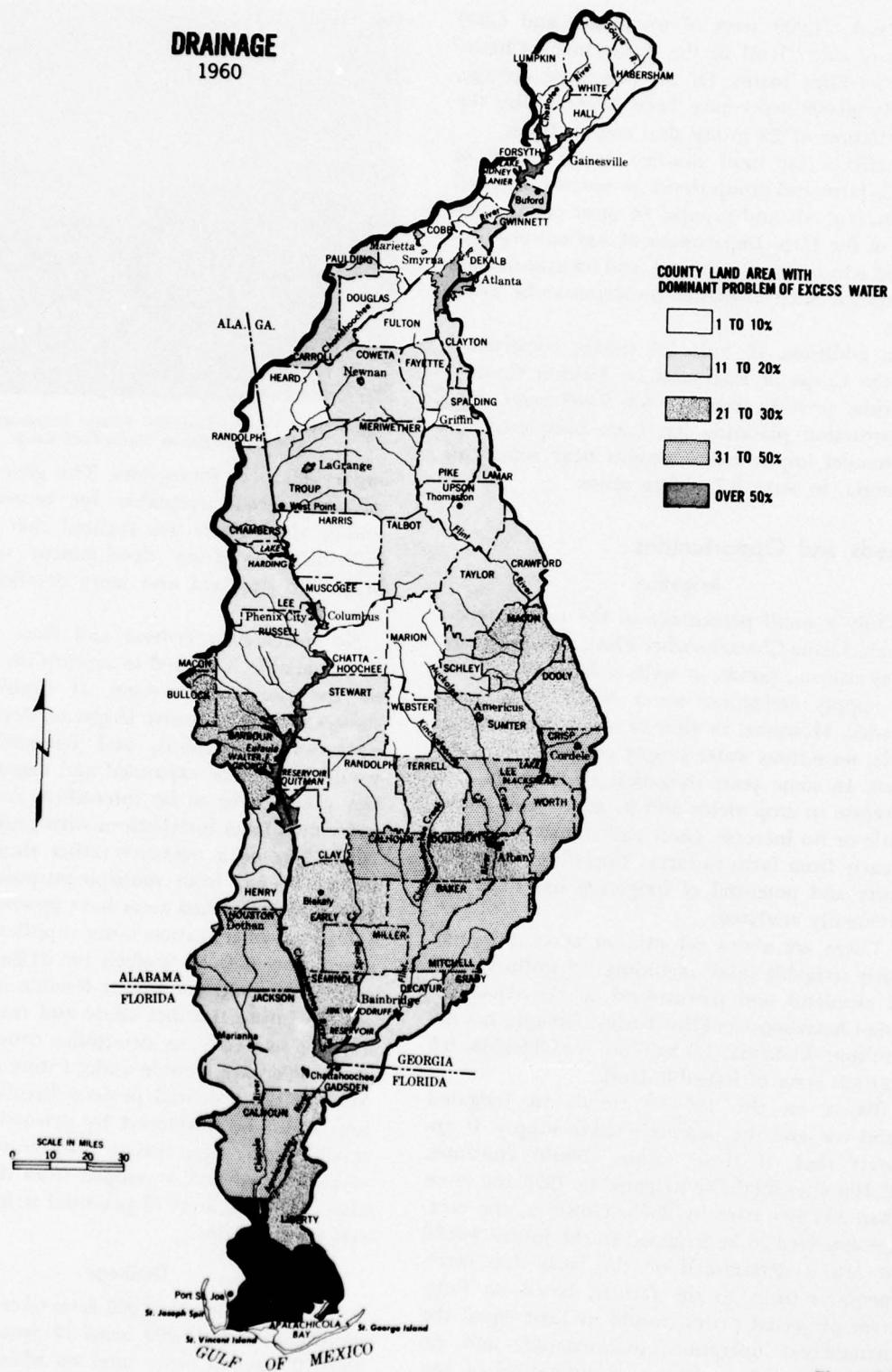


Figure 2.9

tureland, 24,000 acres of woodland, and 6,900 acres of other land in the Apalachicola-Chattahoochee-Flint basins. Of the preceding acreage, nearly 60,000 acres have been benefited by the installation of 22 group drainage facilities.

Facilities for most drained areas consist of single farm and group drainage systems installed by individuals and groups. In most cases, agencies of the U. S. Department of Agriculture provided educational, technical, and/or cost-sharing assistance. Such assistance continues to be available.

In addition, 13 miles of canals, constructed by the Corps of Engineers in Jackson County, Florida, provide drainage for 9,600 acres. Pre-construction planning has been completed for a channel improvement project near Americus, Georgia, to serve 8.7 square miles.

Needs and Opportunities

Irrigation

Only a small percentage of the farms in the Apalachicola-Chattahoochee-Flint basins now have streams, ponds, or wells sufficiently reliable to supply irrigation water when it is most needed. However, in view of ample water available, no serious water supply problems are foreseen. In some years irrigation shows a marked increase in crop yields and in other years shows little or no increase. Costs and returns also vary greatly from farm to farm. Therefore, the feasibility and potential of irrigation has to be individually analyzed.

There are about 6.4 million acres of potentially irrigable land, including 3.9 million acres of cropland and pastureland in the Apalachicola-Chattahoochee-Flint basins. Georgia has 4.9 million; Alabama, 1.0 million; and Florida, 0.5 million acres of irrigable land.

Based on the 1954-60 trends in irrigated land use and the potential water supply, it appears that, if these trends should continue, 63,100 acres might be irrigated by 1975 and more than 137,800 acres by 2000. However, the acreage expected to be irrigated in the future would be less if determined on the basis that incremental returns to the farmer, based on long-term projected prices, would at least equal the incremental operation, maintenance, and replacements costs without consideration of sec-



Figure 2.10 *Typical Sprinkler System Irrigating Tobacco, One of the Basins Major Cash Crops.*

ondary effects or intangibles. This general guide was considered acceptable for reconnaissance studies although it was realized that followup individual irrigation development would be subject to standard and more detailed evaluations.

No increase in Federal and State assistance now available is needed to accomplish irrigation on the projected acreages. If future circumstances require extensive irrigation development, educational, technical, and financial services would have to be expanded and research activities would have to be intensified. Augmenting individual farm installations with project action could become a necessity rather than an incidental benefit from multiple-purpose projects. Upstream watershed areas have potential for development of irrigation water supplies by collective action. Storage projects for irrigation water supply alone do not appear feasible in the foreseeable future. Further study and investigations will be necessary to determine conclusively if the projects are feasible under future conditions. Most of the potential projects involving irrigation could be developed by privately financed small groups. Appropriate projects would have to be selected and developed from the approximately 233,000 acres of potential irrigation projects in the basins.

Drainage

There are about 307,000 acres of cropland and pastureland, 2,019,000 acres of woodland, and 133,000 acres of other land on which the dom-

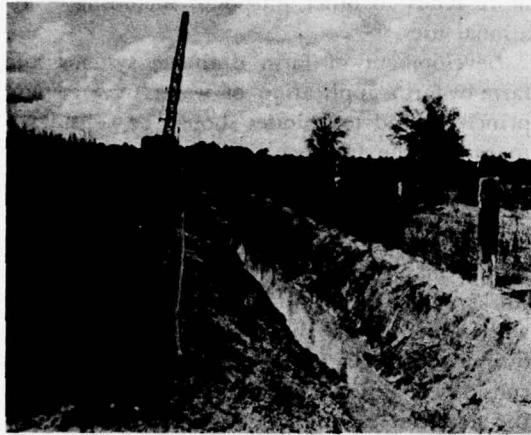


Figure 2.11 *Drainage Project, Under Construction, Will Provide Control of Ground Water Levels.*

inant problem is excess water. Figure 2.9 shows the general distribution of these acreages, by counties. Drainage problems are caused by overflow from streams, tidal action, the overflow of low-lying flatlands by hillside runoff, hillside springs, the accumulation of water in depressions, and by water tables rising near the land surface. Clogging of natural and artificial drains as a result of vegetative growth and siltation, and the reduced effectiveness of major streams as drainage outlets because of sedimentation, are the major causes of adverse drainage conditions in the basins.

The alleviation of these problems presents opportunities to increase production and add greatly to farming convenience. If it becomes necessary to obtain maximum potential production, facilities for timely removal of excess water could ultimately be provided for most of the wetland not now drained. The installation of proper drainage systems could convert the wetlands to more intensive use.

Based on trend, farmers' interest, and the present rate of development it is estimated that about 272,000 acres could be drained by the year 2000; including 20,000 acres of cropland, 18,000 acres of pasture, 224,000 acres of woodland, and 10,000 acres of other land.

In estimating the future agricultural production which could be realized from the basins without new drainage and other resource development, consideration was given to the 1,066,000 acres of land in the basins which might be withdrawn from agricultural uses by the year 2000.

While offsetting land conversions may be made, increases in demand for crops and pasture will require major increases in production per acre. There are, therefore, opportunities for additional drainage to meet the production needs. For example, a significant part of the projected increased need for 306 million pounds of peanuts, 71 million pounds of cotton, and 10 million bushels of corn could be provided through drainage cheaper than on other land not requiring drainage.

In 1958, more than 603,000 acres of the cropland had a dominant problem of unfavorable soil conditions such as low fertility, stoniness or shallowness to rock, low moisture holding capacity, or some other condition that limits root development. By 2000, only 313,000 acres of such land probably will be used for cropland. The reduction of 300,000 acres of cropland could be partially offset by draining wetlands better adapted for crop production and for facilitating soil conservation adjustments in land use elsewhere. Such land-use conversions and improved drainage will frequently provide opportunities for increasing farm income, replacing marginal farmland, and increasing the efficiency of farm operations.

Few tile drains have been installed, but as more intensive use is made of the land, tile drainage will probably be used to a great extent. Pump drainage has a potential where gravity outlets are not available in the lower coastal areas.

Many of the facilities required to effect drainage are of the type now in use. However, some improvements are expected to result from additional research and experience. Facilities now in use include such standard measures as open farm ditches, tile, land grading, control structures, and principal outlets and canals. More complex systems will be required in the major stream flood plains. In the Coastal Plain these will sometimes be complicated by need for flood control measures.

The continued efforts of individual farmers and local and Federal groups and agencies will be needed to meet these drainage objectives.

It is also of paramount importance that provisions be made for maintenance. The effectiveness of the drainage measures installed will soon

be greatly reduced if they are not maintained.

In addition, State governments need to review their statutes and consider any need for new legislation or amendments to old legislation that would enhance drainage activities.

Means of Meeting the Needs

Irrigation

Farm irrigation systems can be established by individual farmers with available technical, loan, and cost-sharing assistance from State and Federal agencies. Accelerated educational services could be provided as technological advances in equipment and irrigation techniques are known. Some irrigation water storage can be provided in multiple-purpose projects, both in upstream watersheds and in main stream reservoirs. About 15,300 farm ponds are expected to be in the basins by the year 2000, and about 30 percent of the stored water should be available for irrigation. This will supply much of the irrigation water required. Additional water needed can be obtained from wells and streams. From the national and study area standpoints, large-scale irrigation projects will not be needed in the Apalachicola-Chattahoochee-Flint basins for increased crop production. However, individual farmers will prefer to undertake irrigation in lieu of other means of increasing net returns from agricultural land use.

Drainage

Maximum production from pastureland and cropland is not expected to be needed during the next 40 years, but drainage of lands suited to these uses can make other applied technologies more effective, thereby contributing to efficiency of the farm enterprise. Drainage facilitates land-use adjustments needed for proper development, wise use, conservation, and protection of the land resource. Thus, farmers may be encouraged to make desirable land-use conversions that would enable them to devote

more lands to other purposes, including recreational uses.

Development of farm drainage systems and farm-by-farm application of water management principles and techniques should be considered to realize the full benefits of drainage. These programs could result from private initiative and expenditures. Onfarm outlet channels, mains, laterals, and surface field ditches would continue as the major types of systems used. Drainage works required on individual farms, together with minor lateral ditches and other works required to serve a group of farms, are generally considered a non-Federal responsibility within the financial capabilities of local interests. Additional tile mains and laterals and pumping should also be considered in applicable areas.

In addition to the individual drainage systems, multiple-purpose flood prevention and drainage projects could be used to alleviate drainage problems requiring project facilities.

The major premises on which the projected drained acreages are based include: (1) Full participation by landowners who have the responsibility for deciding whether or not to drain land; (2) provision for adequate outlets for all individual onfarm and small group drainage; and (3) adequate markets to handle the increased production resulting from drainage after allowing for shifts from inefficient farming units.

Continuation of the Federal cost sharing, research, informational, loan, and technical assistance programs will enable individuals or small groups to provide needed drainage installations.

State, county, and municipal governments are expected to cooperate and contribute to drainage development within the scope of their normal functions.

It is estimated that improvements in upstream watershed multiple-purpose or single-purpose projects will be developed to benefit 1,500,000 acres by 1975, and an additional 423,000 acres by the year 2000.

SECTION V – HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

General

The network of highways and railroads, an abundant water supply, an ample labor force,

adequate power supplies, and quantities of raw materials have contributed to industrialization of the basins. The Atlanta metropolitan area

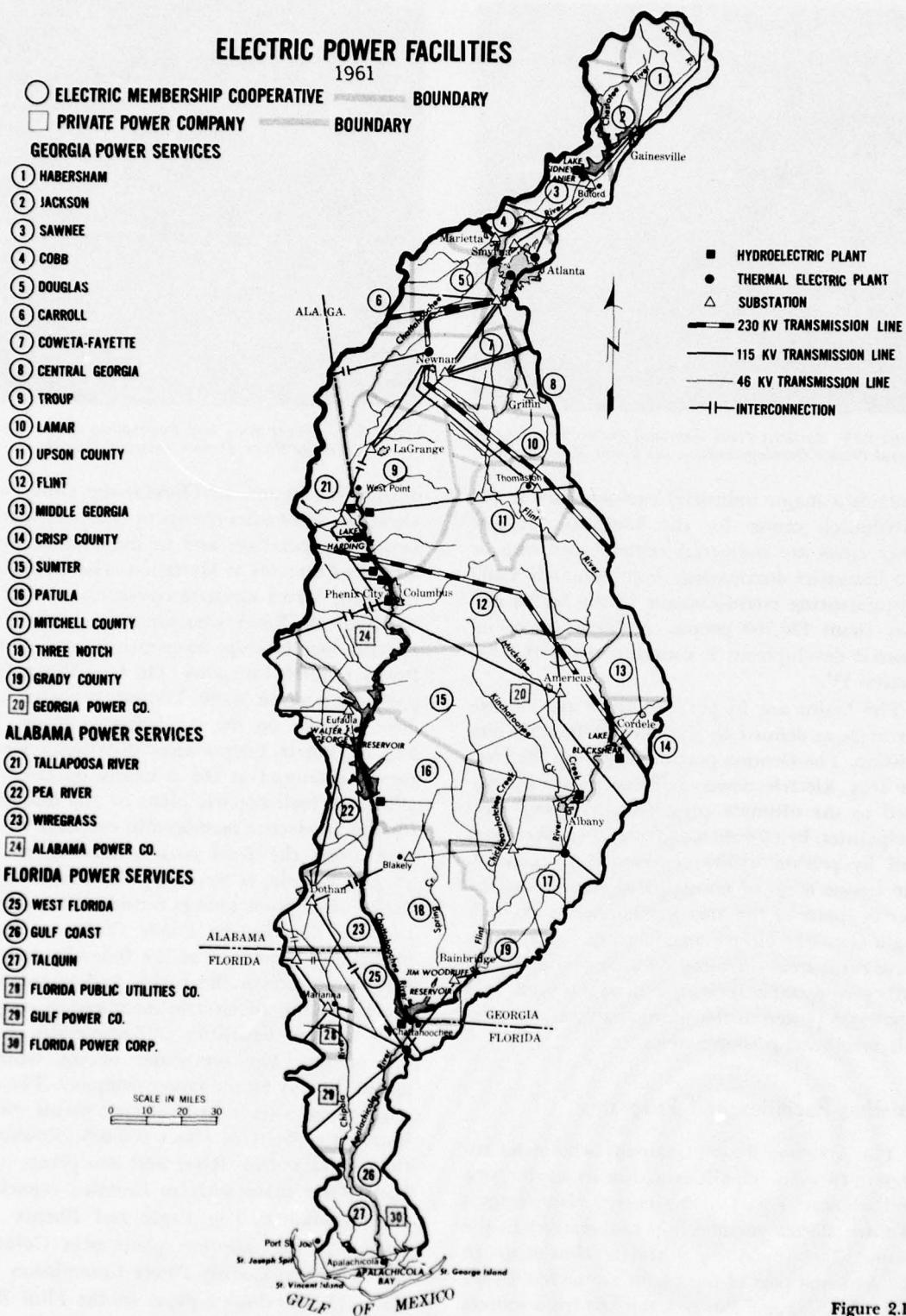


Figure 2.12

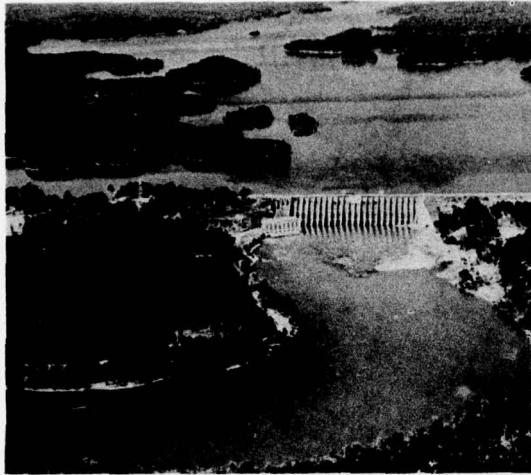


Figure 2.13 Bartletts Ferry Dam and Powerplant, One of Several Private Developments on the Basins Major Streams.

contains a major industrial complex and is the distribution center for the Southeast. Several other cities are industrial centers with one or two industries dominating. Approximately 2,400 manufacturing establishments in the basins employ about 138,700 people. A discussion of industrial development is contained in Part One, Section IV.

The basins are in parts of three power supply areas as defined by the Federal Power Commission. The Georgia portion makes up the largest area. Electric power and energy are distributed to the ultimate customers by several municipalities, by electric membership cooperatives, and by private utility companies. In general, the service areas of municipalities are restricted to city limits or the area immediately surrounding a city. The electric membership cooperatives serve rural areas surrounding urban centers. The utility companies serve the urban centers and wholesale power to the municipalities and electric membership cooperatives.

Existing Facilities and Programs

The Alabama Power Company wholesales energy to two municipalities within its service area and wholesales part of the energy requirements of three electric membership cooperatives in the basins. The remaining ultimate consumers in the Alabama part of the basins are served directly by the Alabama Power Company from sources

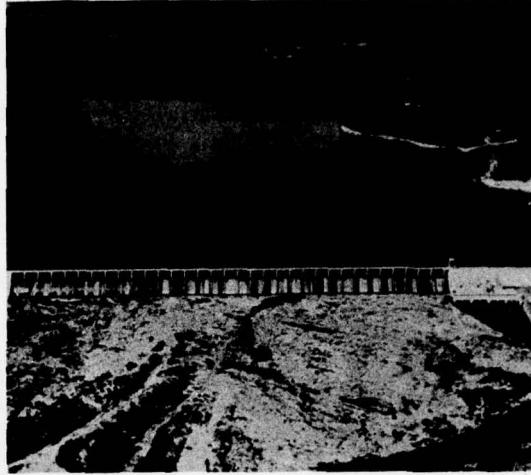


Figure 2.14 Oliver Dam and Powerplant on the Chattahoochee River Above Columbus, Georgia.

outside the basins. In Florida, the Gulf Power Company wholesales energy to two electric membership cooperatives and to the Florida Public Utilities Company at Marianna. The Gulf Power Company serves ultimate customers west of the Apalachicola River who are not served by the electric membership cooperatives and Florida Public Utilities Company. The Gulf Power Company operates an 80,000-kilowatt capacity steam electric plant on the Apalachicola River. The Florida Power Corporation distributes electric energy produced at the federally operated Jim Woodruff hydroelectric plant to one municipality and an electric membership cooperative. The area along the Gulf coast extending to Port St. Joe, Florida, is served by the Florida Power Corporation from sources outside the basins. In Georgia, the Georgia Power Company distributes energy produced at the federally operated Buford project in the basins and at others in nearby basins, to electric membership cooperatives and municipalities and wholesales the excess energy. The remainder of the basins is served directly by the power company. The company operates seven hydroelectric plants with an installed capacity of about 206,000 kilowatts on the Chattahoochee River and two plants in the Flint River basin with an installed capacity of 5,760 kilowatts. The Eagle and Phenix mills operate a 4,100-kilowatt plant near Columbus and the Crisp County Power Commission operates a 15,200-kilowatt plant on the Flint River.

TABLE 2.9
Existing Powerplants

Plant	Operator	River	Normal head (ft.)	Capacity (kw.)	Average annual generation (1,000 kw.-hr.)
Hydroelectric					
Bartletts Ferry	Ga. Power Co.	Chattahoochee	115	65,000	330,000
Blue Springs	Fla. Public Utilities Co.	Blue Springs	14	168	1,200
Buford	Corps of Engineers	Chattahoochee	141	86,000	170,000
Eagle and Phenix	E & P Mills	Chattahoochee	26	4,100	25,000
Flint River	Ga. Power Co.	Flint	27	5,400	47,400
Walter F. George	Corps of Engineers	Chattahoochee	76	130,000	436,000
Goat Rock	Ga. Power Co.	Chattahoochee	66	26,000	170,000
Jim Woodruff	Corps of Engineers	Apalachicola	26.5	30,000	226,000
Langdale	Ga. Power Co.	Chattahoochee	16	4,010	20,000
Morgan Falls	Ga. Power Co.	Chattahoochee	48	16,800	68,000
North Highlands	Ga. Power Co.	Chattahoochee	39	30,000	130,000
Oliver	Ga. Power Co.	Chattahoochee	65	60,000	255,000
Warwick	Crisp County	Flint	30	15,200	58,000
Small plants	Various			4,040	20,000
Steam electric—1959 generation					
Atkinson	Ga. Power Co.			240,000	1,512,000
Warwick	Crisp County			12,500	11,280
Warwick*	Crisp County			5,000	172
Wm. Mitchell	Ga. Power Co.			45,000	197,600
Yates	Ga. Power Co.			550,000	3,636,000
Scholz	Gulf Power Co.			80,000	402,500

* Gas turbine.

Several industrial companies in the basins operate small hydroelectric plants with a total installed capacity of 3,200 kilowatts. The Georgia Power Company operates 835,000 kilowatts of steam electric capacity in three plants and leases 3,200 kilowatts from an industrial source.

The electric membership cooperatives distribute electric energy to most of the rural areas. Distribution in the urban areas is by the utility company, except for those municipalities operating their own systems. Among the major power producing agencies and companies, electric energy is exchanged over high voltage, 115 to 230 kilovolt transmission lines. Electric energy is readily transported from one area to another to meet emergencies or normal load conditions.

Needs and Opportunities

Short-range trends of future use can be predicted by analyzing historic trends. For long-range estimates of future electrical energy requirements, the factors acting to slow the explosive growth of the past three decades need to be considered.

The projected 1975 electric energy requirements were based on an analysis of the historic growth by class of customer and by usage per customer for each distributor of energy. For the

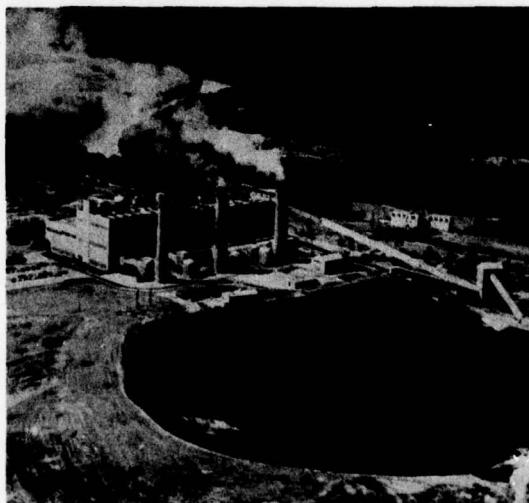


Figure 2.15 *Steam Powerplant near Atlanta Uses Chattahoochee River Water for Cooling.*

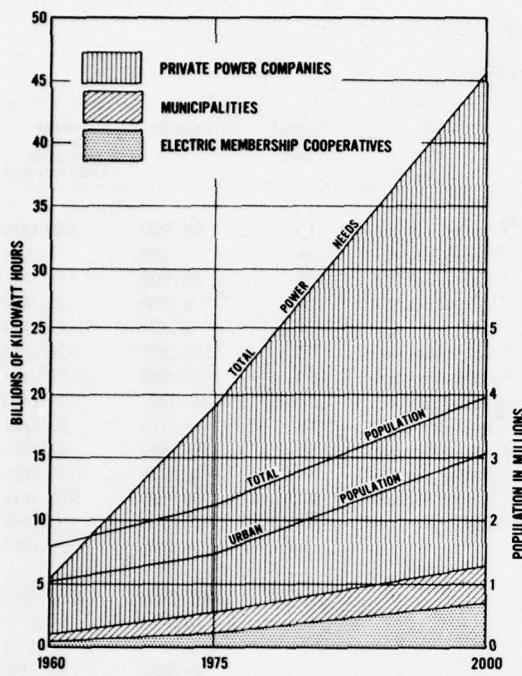


Figure 2.16 *Power Needs and Population.*

Alabama, Florida, Georgia, and Gulf Power Companies, total usage was used. Commercial and industrial customer usage was analyzed and compared to local power company projections and to national averages for compatibility. Existing types of commercial and industrial establishments in the area were considered as being indicative of the type which would continue to expand in the area. The effect of the Atlanta metropolitan area and barge navigation to Columbus, Atlanta, and the Albany urban areas on commercial and industrial electric load growth was considered in the projection.

The long-range projection is also based on the historic load growths, tempered by saturation and new-use factors for residential customers. New residential construction will include many built-in appliance features, such as ranges, refrigerators, washing and drying units, deep freezers, air conditioning, heat pumps, and vacuum cleaners. Commercial establishments will have improved lighting, central air conditioning, and much electric-energy-using equipment. The continued shift of manufacturing industries to automation, coupled to advances in pro-

duction methods, will continue the growth of industrial electric energy usage.

The projected energy requirements for the basins are projected to increase from about 5.3 billion kilowatt-hours in 1959 to about 18.9 billion kilowatt-hours by 1975 and to about 45.2 billion kilowatt-hours by the year 2000. The demands, based on weighted annual load factors of 57.5 percent for 1959, 61.4 percent for 1975, and 61.9 percent for 2000, are 1,050,000 kilowatts, 3,515,000 kilowatts, and 8,327,000 kilowatts, respectively.

Means of Meeting the Needs

Hydroelectric power potentials exist because of the abundant rainfall, runoff, and available heads. Hydroelectric power, however, is used most advantageously for peaking purposes. These purposes require coordination of hydroelectric facilities with thermal electric generating facilities and involve public and private cooperation.

The Corps of Engineers has under construction the Walter F. George Dam and Reservoir on the Chattahoochee River. The project includes a 130,000-kilowatt powerplant using a gross head of 76 feet. The average annual generation is estimated to be 436 million kilowatt-hours.

The Corps of Engineers has prepared and submitted to Congress a "Survey Report of the Flint River," February 1962, and a "Survey Report of Chattahoochee River at and in the Vicinity of West Point, Georgia," November 1961. In the Flint River report the plan of development recommends five projects. The Spewell Bluff, Lazer Creek, and Lower Auchumpkee would be at the Fall Line reach of the river and would provide flood control storage, hydroelectric power, and storage for downstream navigation. The Raccoon and Lower Vada projects would be primarily for navigation to Albany and would be in the lower river between Albany and Lake Seminole.

The Chattahoochee Survey Report describes West Point, Franklin, and Cedar Creek projects between West Point and Atlanta. The three developments would provide flood control storage, hydroelectric power, and controlled flow for navigation. The West Point project was authorized by the River and Harbor Act of 1962.

TABLE 2.10
Data on Potential Hydroelectric Power Projects

Project	River	Normal pool elevation (ft.)	Power storage (acre-ft.)	Gross head (ft.)	Installed capacity (megawatts)	Average annual generation (1,000 kw-hr.)
Spewrell Bluff	Flint	700	322,000	157	100	133,000
Lazer Creek	Flint	543	88,000	126	87	121,600
Lower Auchumpkee	Flint	417	135,000	87	81	122,800
Miona	Flint	320	22,000	48	39	63,000
Mountain Creek	Flint	272	7,500	36.5	42	60,000
Flint River	Flint			30	*2	
Lower Vada	Flint	126	11,000	49	28	167,000
New Bridge	Chestatee	1,220	180,000	156	50	34,400
Irwins Bridge	Chattahoochee	1,300	30,900	103	20	14,800
Mud Creek	Chattahoochee	1,197	87,500	130	36	48,400
Cedar Creek	Chattahoochee	745	134,000	60	50	101,000
Franklin	Chattahoochee	685	20,000	50	50	108,500
West Point	Chattahoochee	635	284,000	70	107	191,000
New Riverview	Chattahoochee	560		39	65	115,000
Columbus	Chattahoochee	223		33	30	130,000

* Addition to existing plant.

Two additional sites on the Flint River, the Miona and Mountain Creek projects, could develop the head between the Fall Line developments and the existing Crisp County Warwick project. The normal drawdown for power purposes on these two projects would be limited, enhancing the potential recreational use. With the added streamflow regulation afforded by the upper dams and reservoirs the open bay in the existing Flint River powerplant operated by the Georgia Power Company could be utilized by the installation of a 2,000-kilowatt capacity unit.

There are several potential powersites in the headwaters of the Chattahoochee River upstream from Lake Lanier. Three of these sites, Mud Creek and Irwins Bridge on the Chattahoochee and New Bridge on the Chestatee, are potential hydroelectric power developments.

In operation, the three upstream plants on the Flint River, Spewrell Bluff, Lazer Creek, and Lower Auchumpkee, could operate in tandem with two of the plants under supervisory control. The three plants, Cedar Creek, Franklin, and West Point, could also operate in tandem; two would be operated by remote control from the third.

Construction of the developments discussed

herein would require construction of high-voltage transmission lines from the major generating sources to load centers or to switching stations for tying into the existing transmission grid system. The projected load growth will require additional transmission lines and extension of distribution lines. Substations will need to be enlarged and new substations constructed to meet the shifting load patterns. Transmission from sources to load centers and distribution to ultimate customers will pose no problem.

Some of these possibilities are feasible as single-purpose power developments, others are not. All involve multiple-purpose considerations.

Pump Storage

Pump storage could be installed in the Spewrell Bluff and Lazer Creek projects using Lazer Creek and Lower Auchumpkee as afterbays. The construction of the Miona development would create a forebay which would allow pump storage units to be installed in the Lower Auchumpkee project.

Adjacent to the proposed Cedar Creek reservoir, sites on Dog River and on Anneewakee Creek in the Anneewakee recreation area have potential for pump storage. The site considered

on Dog River would create a gross static generating head of 247 feet and a maximum static pumping head of 257 feet. The storage reservoir would inundate about 8,500 acres at elevation 992 feet and have storage for 371,000 acre-feet, of which 21,000 acre-feet could be used for power generation in a 3-foot drawdown. The site on Anneewakee Creek would create a gross static generating head of 170 feet and a maxi-

mum static pumping head of 180 feet. The storage reservoir would inundate 1,900 acres of land at elevation 915 feet and have a storage of 73,500 acre-feet, of which 21,000 acre-feet could be used for power generation in a 13-foot drawdown.

Detailed studies should be made to determine the potentialities of pump storage when projects are considered for development in the future.

SECTION VI – SOIL CONSERVATION AND UTILIZATION

General

Soil conservation and utilization consists of both enduring and recurring or short-term practices to protect the basic land resources and to provide a stable base for permanent agriculture. Enduring conservation practices include critical area planting, land smoothing, terracing, pond construction, grassed waterways, and various types of more or less permanent plantings. Recurring conservation practices include conservation cropping systems, contour farming, and cover cropping. This Section is largely confined to a discussion of soil conservation and utilization of cropland and pasture.

Until the 1930's, the agricultural economy of the Apalachicola-Chattahoochee-Flint basins was based on the production of row crops, principally cotton, corn, and peanuts. By the mid-1930's, the frequency of such plantings and soil erosion had

greatly depleted the nutrients in the Upper Coastal Plain and the Piedmont soils. The irregular topography and the relatively small amount of cover during much of the year resulted in considerable erosion and loss of soil.

Since the 1930's, interest and activity in conservation has grown steadily. Considerable progress has been made in the conservation and utilization of farmland by land owners and operators. This has been aided by the combined efforts of Federal, State, and local agricultural groups. The 25 soil and water conservation districts within or partly within the basins have played a major role in establishing conservation practices.

Conversion of erodible cropland to grassland and woodland use has been most rapid in the last two decades. The process has been encouraged by comparatively high livestock and wood-products values and by general technical advances in agricultural practices.

Although agricultural land has many classifications, the Land Capability Classification of the U. S. Department of Agriculture is used to illustrate the type and degree of land problems. Under this system, lands are assigned one of eight capability classes according to their capability for intensive use and the treatments required for sustained use. All lands in the same capability class have limitations and management problems of about the same degree, and the risks of soil damage or limitations in use become progressively greater from Class I to Class VIII.

Classes I, II, and III soils are suitable for cultivated crops and all other land uses. Lands in Class I have few limitations that restrict use; lands in Class II have some limitations that re-



Figure 2.17 *Soil Conservation Measures Prevent Erosion and Increase Production.*

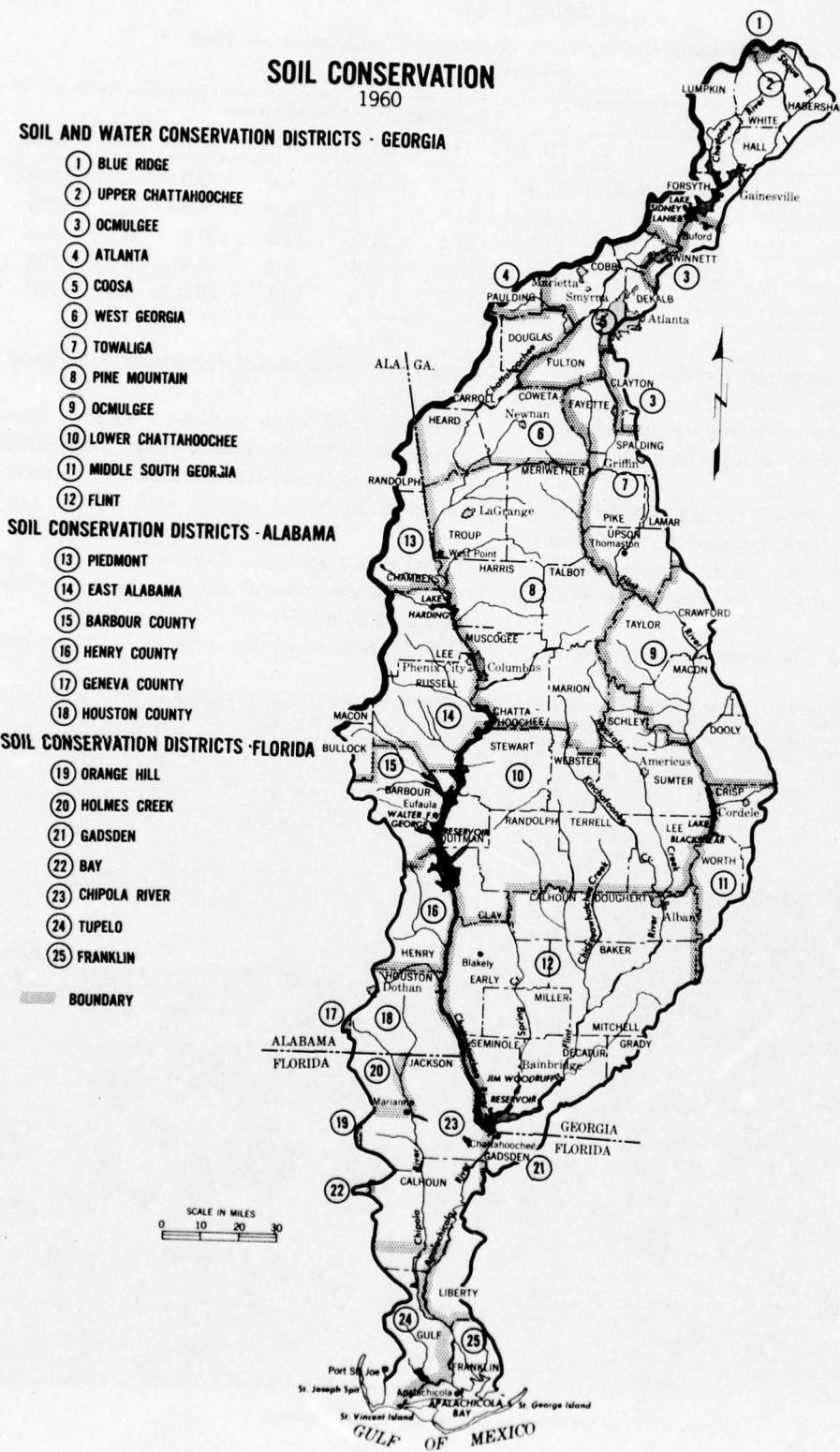


Figure 2.18

TABLE 2.11
Distribution of Land Use by Land Capability Classification — 1958
(percent)

Land use	Land Capability Classification								Total
	I	II	III	IV	V	VI	VII	VIII	
Cropland	12.1	52.6	25.9	7.2	0.3	1.0	0.9	—	100
Pasture	5.0	32.6	33.0	17.4	2.2	5.9	3.9	—	100
Forest	1.0	11.0	21.1	21.0	11.7	14.3	19.8	0.1	100
Other	8.8	24.6	32.2	15.2	2.8	5.4	5.4	5.6	100
Basins average	4.3	22.7	24.0	17.3	7.8	10.1	13.3	0.5	100

duce the choice of crops or require moderate conservation practices; and lands in Class III have severe limitations that reduce the choice of crops or require special conservation practices or both.

Class IV lands are suitable for cultivated crops on a limited basis; however, under cultivation these lands require very careful management and they are not suitable for row crops year after year.

Classes V, VI, and VII lands normally should

be used for pastureland, rangeland, woodland, and wildlife.

Soils and land forms in Class VIII have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, and esthetic purposes.

The Land Capability Classification and the 1958 use of agricultural land in the basins are shown in Table 2.11.

Over 90 percent of the cropland is on the bet-



Figure 2.19 Mountain Valleys Provide Good Farmland.

ter lands. However, opportunities still exist for land-use conversions to conserve and maintain the land resources.

Existing Facilities and Programs

There are several major soil and water conservation and utilization programs in operation in the basins. These programs provide services in cost sharing, credit, technical assistance, education, and information. The 25 soil and water conservation districts operating in the basins are under State charter and coordinate various kinds of State and Federal aids that are available to farmers. Many private organizations and groups also make their services available to these districts.

Water erosion continues to be a land-use problem throughout the basins, except near the Gulf coast. Wind erosion is also a problem in localized areas in the lower portions of the basins. Soil erosion is classified by degrees into five groupings. The least eroded soil, Class 1, totaling about 997,000 acres, has more than 75 percent of the original topsoil remaining. Class 2, about 2.8 million acres, is moderately eroded and has 25 to 75 percent of the original topsoil remaining. Class 3, about 1.7 million acres, is severely eroded and has less than 25 percent of the original topsoil and 75 percent or more of the subsoil remaining. Class 4, about 331,000 acres, is very severely eroded. Class 5, about 36,000 acres, is gullied land.

As of January 1958, some 2,023,000 acres of cropland and pastureland and 455,000 acres of other agricultural land had dominant erosion problems. At the same time, some 747,000 acres of cropland and pastureland and 198,000 acres of other agricultural land had dominant unfavorable soil condition problems. Some of the erosion and unfavorable soil problems involve the same acreage. About 344,000 acres of cropland and pastureland and about 40,000 acres of other agricultural land had no problems that limited use.

As of January 1, 1960, three watershed projects were operational in Georgia: Sautee Creek, 20,000 acres in White County; Potato Creek, 154,000 acres in Spalding, Lamar, Pike, and Upson Counties; and Palmetto Creek, 13,450 acres in Harris County. Applications for project as-



Figure 2.20 *Drift from Wind Erosion, Coastal Plain, Georgia, Shows the Need for Conservation Practices.*

sistance in planning had been received by the State Soil Conservation Committee from 11 other groups in Georgia on areas totaling 637,000 acres. Two watershed applications totaling 195,000 acres had been submitted by Florida groups. None were submitted in Alabama. Other installations and developments, which affect or are affected by, soil conservation and utilization programs include defense and other government installations, roads, mining, and urban and industrial areas.

In 1960, some 6,700 farm ponds occupying about 24,000 acres had been installed in the basins for use either singly or in combination for livestock water, irrigation, fire protection, sediment control, and fishing. They ranged in size from about 3 to 5 surface acres. About 30 percent of these ponds were used for livestock water and other domestic uses, 5 percent were used for irrigation, and nearly all were used for fishing and other recreation.

Needs and Opportunities

In order to meet the estimated food and fiber needs by the year 2000, agricultural production must double. To attain such an objective, yields can be increased and sustained by improved management and conservation measures.

Different methods are being used to prevent erosion and restore soil resources to a higher and more profitable level of utilization. Me-

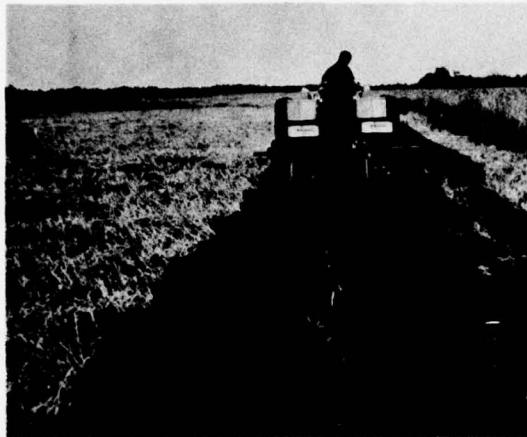


Figure 2.21 *Mulch Planting—A Cropland Soil Conservation Practice.*

chanical practices, such as terracing, contour farming, and waterway development, used in combination with cultural practices, such as grasses and legumes in conservation cropping systems, achieve enduring results.

Many opportunities exist in adjusting farming systems to provide for increased soil protection and productivity and to increase farm income. Some opportunities center around the degree of conservation that will provide the greatest increase in farm income or the combination of practices that will minimize production costs for a given level of conservation. Opportunities exist for conservation programs designed to: Achieve needed treatment of eroded and depleted soils; protect land against erosion and other deterioration; protect and improve farm woodland and grassland; conserve moisture; reduce flood and sediment damage; improve the quality and dependability of water; and apply conservation techniques in the management of water and increase overall efficiency of land management.

The total effects of agricultural programs are difficult to determine accurately. Revised farm plans, changing ownership, and fluctuating economic conditions have made many installed measures unnecessary and have created new needs. For example, many miles of terraces were installed on cropland which has been subsequently converted to grassland. This points out the need for planning basically sound land use prior to applying conservation treatment.

In 1959, the land area of the basins totaled

12,491,000 acres. Of this, some 11,568,000 acres were used in the production of agricultural products, including forest products. By the year 2000, an estimated 10,502,000 acres are expected to be available for agricultural production. There will be a need for some resource development and for more efficient land use. Essential elements of resource development include improved levels of management, conservation practices, and the adoption of technological improvements. Some 3,399,000 acres were in cropland and pastureland in 1959. By 2000, 4,350,000 acres are expected to be used as cropland and pastureland. This will increase the needs for conservation treatment of openland. By year 2000, about 31 percent of the land expected to be used for cropland and pastureland would be benefited by conservation treatments.

By year 2000, about 877,000 acres of cropland are expected to have erosion problems and about 313,000 acres of cropland are expected to have unfavorable soil conditions. Conservation measures would benefit a total of about 2,254,000 acres of pastureland and rangeland. Some of the treatments for lands expected to be used for pastures by year 2000 and the estimated acres that would be benefited are shown in Table 2.12.

TABLE 2.12
Pasture and Range Requiring Conservation Treatment or Control—Year 2000
(thousands of acres)

Establish or reestablish vegetation	665
Improve vegetative cover	372
Reduce overgrazing	284
Provide fire protection	64
Control erosion	70
Control rodents	10
Control noxious weeds	204

Some of the above pasture and range treatment or control measures may be expected to be applied on the same acreage. Solutions include management of soil, water, livestock, and vegetation. About 80,000 acres of land classed as other will need conservation treatment due to dominant problems of erosion and unfavorable soil conditions.

Data on the woodland needing conservation treatment are included in Section VII, Forest Conservation and Utilization.

Land conversion, or the shift in type of land use, is expected to be a continuous process in the basins. By 2000, some 283,000 acres now used for pasture, woodland, and other purposes will need to be converted to cropland. Also, 386,000 acres of cropland, woodland, and other land will need to shift to pastureland and rangeland. These probable land-use conversions conform to both limitations of the soil conditions in the basins and to trends indicated by past developments under similar conditions.

Means of Meeting the Needs

The systematic use of applicable soil and water conservation techniques should be encouraged to avoid costly losses of the soil resources, to develop the lands for future uses, to provide efficient and continuing production of food and fiber, and to improve watersheds and water resources for both agricultural and nonagricultural uses.

High-level management in connection with selection and application of soil conservation practices will be necessary to accomplish desirable land-use changes and improve the soil resource to the minimum point where satisfactory levels of production would continue to be attainable.

High-level management of croplands should include the following: (1) Proper selection and rotation of crops; (2) control of excess water with drainage, vegetated waterways, and structures; (3) improvement of soil productivity and workability by using correct amounts of fertilizer and lime and maintenance of organic matter at high levels; (4) conservation of soil materials, plant nutrients, and soil moisture by proper combinations of soil and water conservation measures; (5) selection of proper planting and seeding times; (6) correct tillage methods; (7) control of weeds, insects, and plant diseases; and (8) additional farm ponds as needed.

High-level management for pasture and range includes management of soil, water, livestock, and vegetation. Soil and range management includes the application of lime, nitrogen, phosphate, potash, and other nutrients in the proper amounts as indicated by the results of soil tests. Nutrients should be applied in sufficient quantities to grow plant cover that will protect the



Figure 2.22 *Beef Cattle on Tame Pasture, with Improved Vegetative Cover.*

soil and provide livestock forage. The number of livestock and the grazing periods should be regulated so that the pasture plants will grow vigorously during the grazing season. Vegetative management should include proper mowing, the use of chemicals for weed and brush control, and fire protection. Water management should include an adequate number of properly distributed farm ponds. Needed management practices for woodlands are included in Section VII.

To aid in providing the most efficient soil conservation program, additional studies are required. Data on costs and returns of conservation farming practices and systems are needed. Intensive studies should be made on how to reduce, and, if possible, avoid the detrimental effects of land-use shifts. Studies are needed of the institutional, educational, and social factors that influence farmers to apply, or not to apply, soil conservation practices and plans. Studies are needed to enable technicians to make improved estimates of the need for cost sharing for various practices in watershed programs.

Studies could be initiated to determine alternative sources of income or new income opportunities for people whose lands will go out of farming as a result of changing land-use patterns. Studies of economical ways to convert hundreds of small tracts of idle land into recreation, forestry, and other productive uses appear desirable. It is estimated that idle or relatively unused land in the basins will total 1,034,000 acres in 1975 and 1,500,000 acres in 2000. A

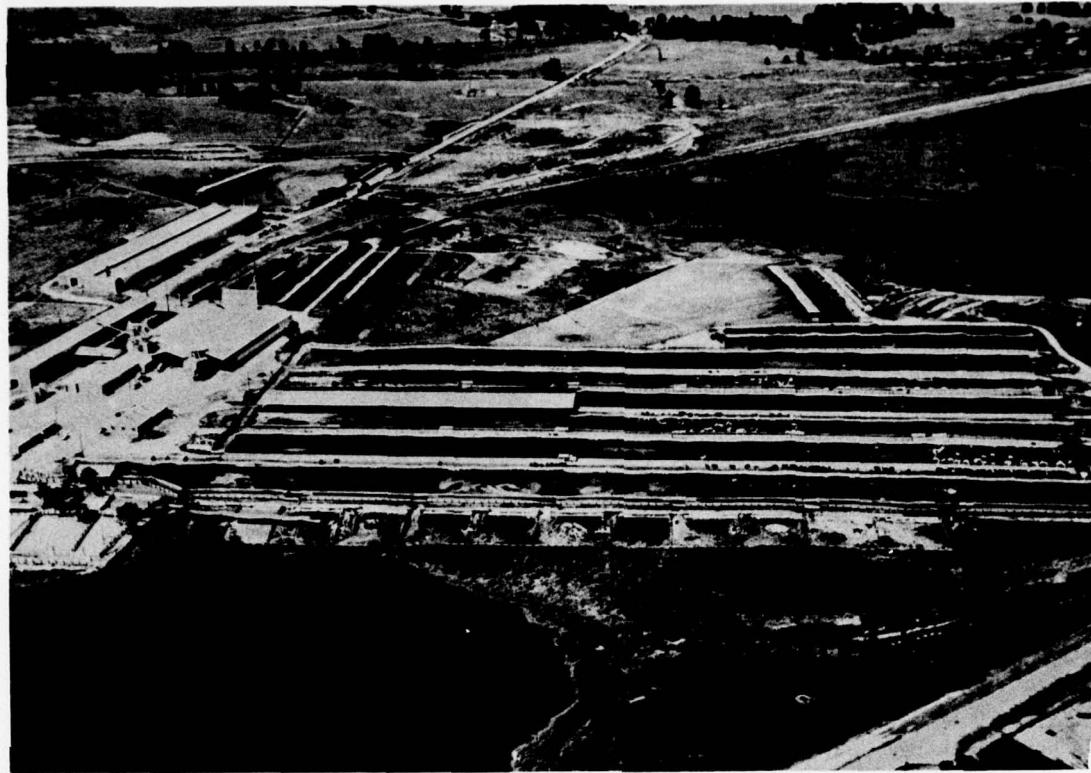


Figure 2.23 *Feed Mill and Cattle Pens Centrally Located to Grassland in Sumter County, Georgia.*

possible means of alleviating this problem would be acquisition of these uneconomical tracts by local public bodies. The affected land could then be redeveloped for economically sound uses. As with urban renewal, a large portion of the cost of this rural renewal could be recovered as the redeveloped lands suitable for private operations are sold.

Selected plant management studies are needed to insure that livestock production continues as an important enterprise.

Technical assistance of the type and degree now available under current programs will be sufficient to carry out the soil and water conservation practices involved in the anticipated land-use changes to the year 2000. In many cases, however, technical assistance is limited to planning. Increased emphasis should be given to financial assistance programs to encourage gainful soil and water conservation practices which provide the most enduring conservation benefits attainable on the lands where they are applied.

SECTION VII – FOREST CONSERVATION AND UTILIZATION

General

Wood production and processing are important in the Apalachicola-Chattahoochee-Flint basins. The expected demand for forest products indicates a need for doubling timber and gunnnaval stores production by the year 2000.

Existing Facilities and Programs

Forests occupy some 8,169,000 acres of the total 12,417,000 acres of land, exclusive of water bodies, in the basins. About 25,000 woodland acres are classed as noncommercial. The 8,144,000 acres of commercial forest include

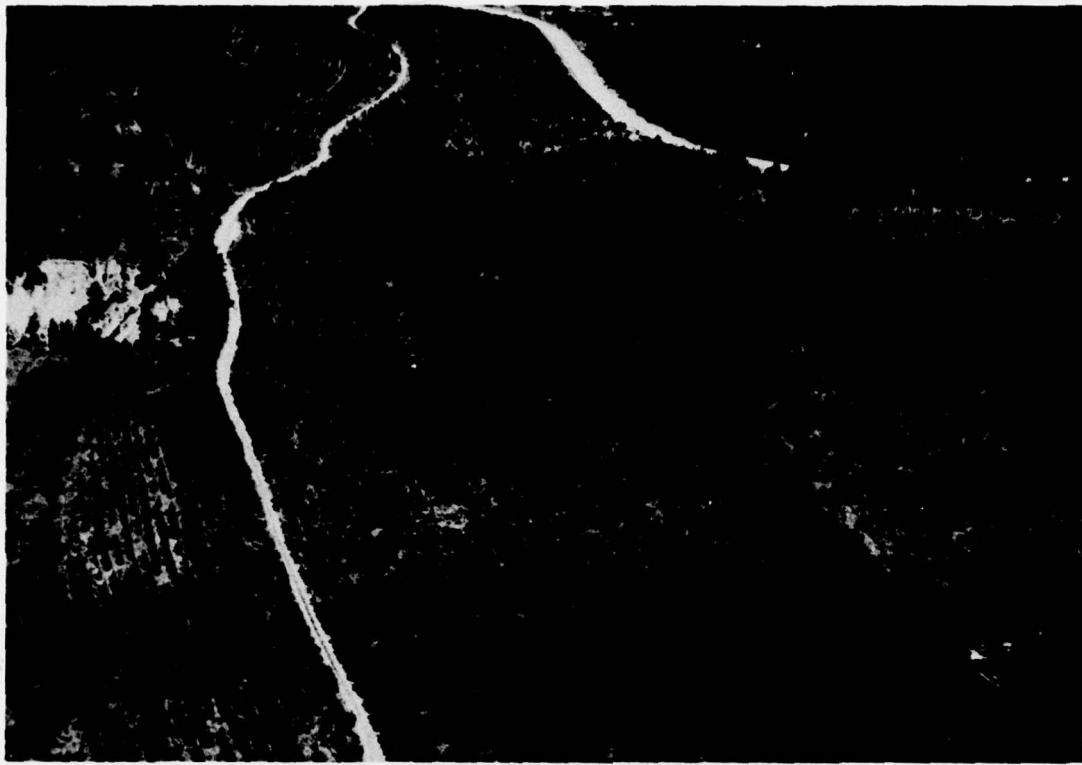


Figure 2.24 *Reforestation Controls Erosion Adjacent to Providence Canyon in Stewart County, Where Severe Gullyling Has Created Georgia's Little Grand Canyon.*

1,050,000 acres in Alabama, 1,199,000 acres in Florida, and 5,895,000 acres in Georgia.

Approximately 389,000 acres of forest land are in Federal ownership, including 208,000 acres in the Chattahoochee and Apalachicola National Forests. Public non-Federal forest ownerships account for 32,000 acres. The remaining 7,748,000 acres in private ownership includes some 1,391,000 acres owned or under long-term lease by pulp and paper companies. The other 6,357,000 acres are about equally divided be-

tween farm woodland and private nonfarm, non-industrial holdings.

Pine forests make up slightly more than half of the commercial forest area. Longleaf and slash pine are the principal species in the Coastal Plain, loblolly and shortleaf pine predominate in the Piedmont, and white pine is important in the Blue Ridge. Virginia pine is locally important in certain northern sections of the Piedmont.

Upland hardwoods, the second most important

TABLE 2.13
Commercial Forests by States and Major Type Groups
(thousands of acres)

Forest-type group	Alabama	Florida	Georgia	Total
Pine	541	617	3,034	4,192
Oak-pine	100	115	564	779
Upland hardwoods	227	259	1,275	1,761
Bottom land hardwoods	182	208	1,022	1,412

FORESTRY
1960

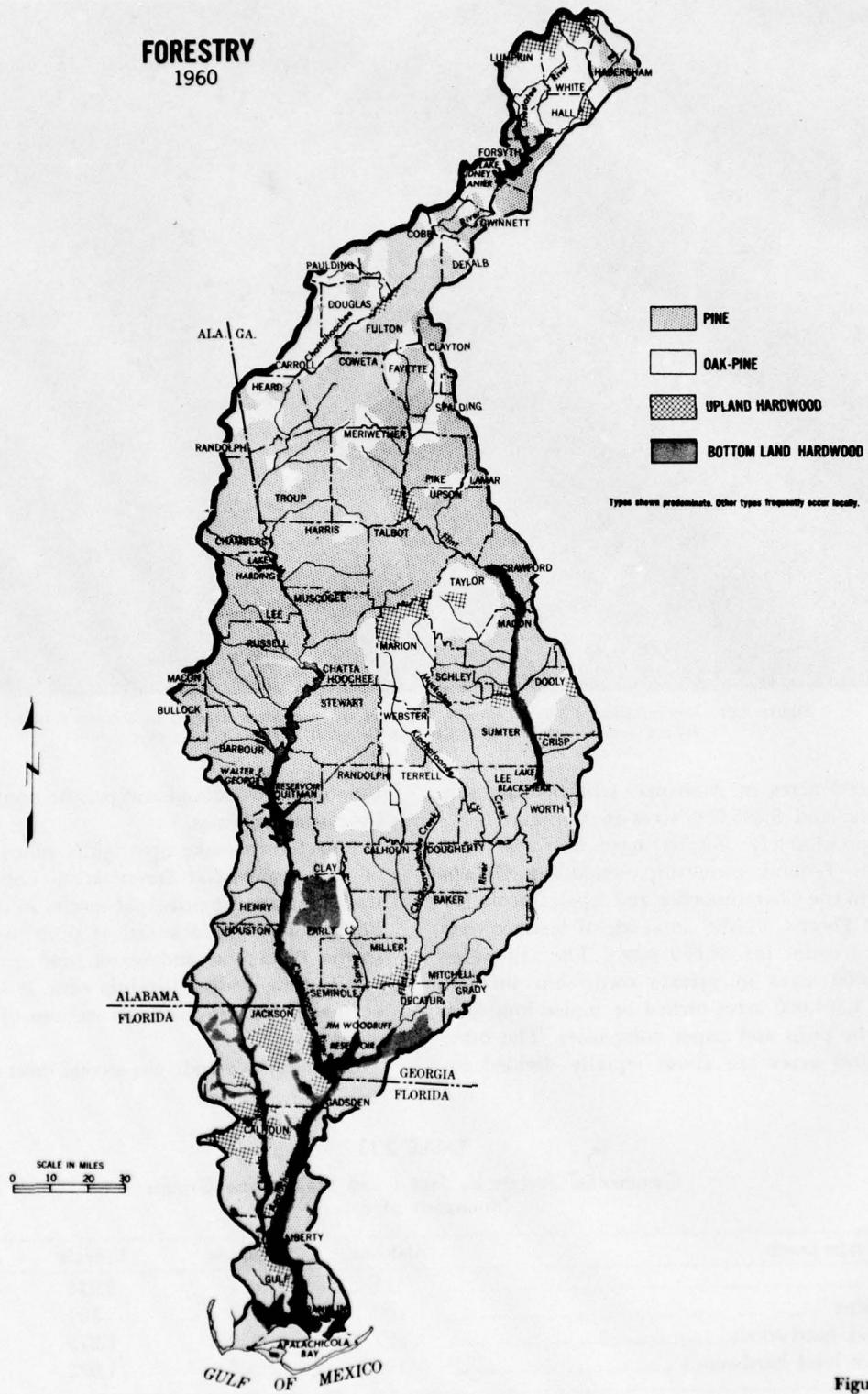


Figure 2.25

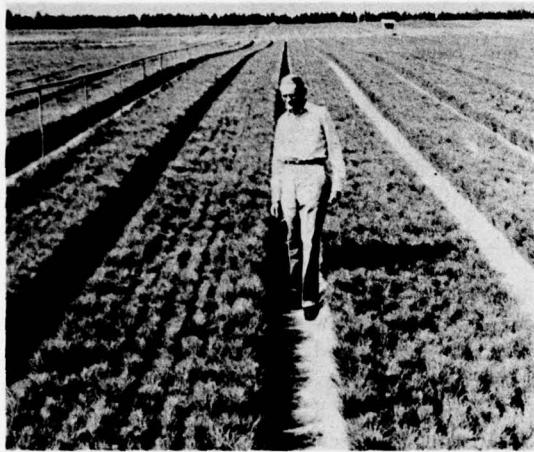


Figure 2.26 *Pine Seedlings Growing in Nursery at Albany, Georgia.*

group, consist of upland oaks, hickory, yellow-poplar, soft maple, and associated hardwoods. Some pines may be included in these forests but they comprise less than 25 percent of the stand.

Bottom land hardwoods, mainly black and tupelo gum, cypress, ash, maple, and bottom land oaks, are normally found bordering major rivers and tributaries. Oak-pine stands are scattered throughout the basins and include the species normally found in the pine and upland-hardwood types.

The commercial forest land contains 1,849 million cubic feet of softwood and 1,853 million cubic feet of hardwood growing stock. Some 199 million cubic feet of growing stock were cut in 1959 for all products. Sawlogs were the major product harvested, followed by pulpwood. The remainder of the growing stock cut went into miscellaneous bolts, fuelwood, piling, posts, and ties. The stumpage value of the wood harvested in 1959 was \$19.9 million.

There are approximately 640,000 faces of slash and longleaf pine trees being worked for gum-naval stores. The wood-naval stores resource is becoming scarce and an alternative source of naval stores will be needed shortly. Anticipating this, all major producers of wood-naval stores have entered the gum-naval stores production field.

Sulphate pulpmill tall oil production has increased considerably in recent years, but is now approaching maximum output from existing mills. New mills or additions to existing mills

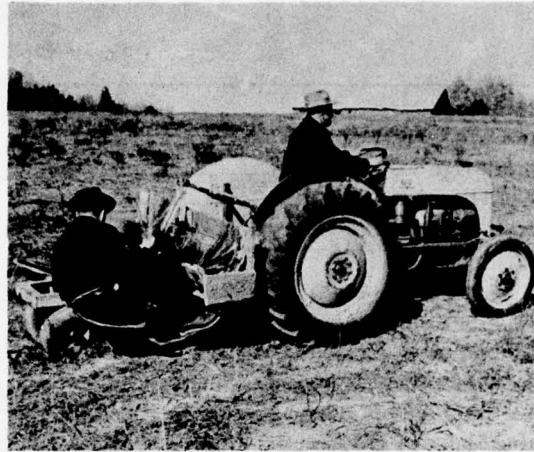


Figure 2.27 *Planting Pine Seedlings to Reestablish Trees on Poor Cropland.*

will allow some increase in total naval-stores production in the future from this source.

There are a number of active programs for improving forestry practices and yields in the basins. The States of Georgia, Florida, and Alabama are accelerating their programs for management assistance, and more woodland owners are being interested in improving their woodland. In addition, both industry and consulting foresters are helping interested landowners manage and improve their forest lands.

Public and private organizations support research that relates to forest problems and needs of the basins. Included among the organizations are the agricultural experiment stations, the U. S. Forest Service, various State colleges and universities, State forestry services, the wood-using industries, and several foundations. Protection, management, utilization, and genetic studies all receive emphasis.

Major emphasis on educational programs is provided by the State forestry organizations through field personnel and by trained district and central office specialists.

In 1960, all of the woodland was under organized fire protection, except for 195,000 acres in Baker, Peach, Quitman, and Towns Counties, Georgia. Most of the protected areas in the basins have been protected for more than 10 years. Georgia, Florida, and Alabama forestry organizations have done an effective job in reducing wildfire losses, but are not fully staffed or equipped to cope with critical fire periods.

TABLE 2.14
Forest Production and Value

Item	Unit	1959	1975	2000
Growing stock, annual cut	cu. ft.	199,000,000	272,000,000	394,000,000
Stumpage value	dollar	19,900,000	27,200,000	39,400,000
Gum-naval stores	face	640,000	880,000	1,280,000
Net leasing value of naval stores	dollar	128,000	176,000	256,000

Major tree planting programs are being carried out in the basins. The Georgia Forestry Commission distributed nearly 50 million tree seedlings in the basins during the 1959-60 planting season. The Florida Forest Service and the Alabama Division of Forestry each provided approximately 15 million seedlings to the basins during the same period. Other nurseries, mainly those owned by pulp and paper companies, distributed additional seedlings to the basins. An average of 800 trees are being planted per acre, although planting prescriptions range from about 600 to 1,200 seedlings per acre. About 70 percent of the seedlings planted were slash pine,

and 20 percent were loblolly pine. Other species planted were white, Virginia, and longleaf pine, red cedar, and yellow poplar.

The Naval Stores Conservation Program is administered by the U. S. Forest Service for the Agricultural Conservation Program. The Service provides conservation payments for carrying out certain approved forestry practices on the land. Of the 56 producers in the basins, some 43 are enlisted in the Naval Stores Conservation Program and work 550,000 of the 640,000 faces now treated for gum production.

There have been no recent major epidemics of insects or diseases in the woodlands of the



Figure 2.28 Boys and Pine Seedlings Grow Up Together.

basins, although this is an ever-present danger and many local outbreaks occur periodically. Field technicians help detect outbreaks and report them for appropriate action.

Needs and Opportunities

In view of projected increase in population, income, and gross national product, it is estimated that by the year 2000 approximately 394 million cubic feet of growing stock will be cut annually. The projected forest acreage has the capacity, if properly managed, to meet this need.

The wood-naval-stores industry will eventually use all the economically suitable stumpwood, and production from this source will have to be replaced. Gum-naval stores will be the principal replacement, and production will have to be doubled to maintain total present output of naval-stores products. Enough slash pine and longleaf pine trees of a suitable size will be available for production.

Means of Meeting the Needs

The overall woodland acreage is expected to decline by about one-fourth by 2000. An expected increase in nonfarm woodland would be more than offset by a decline in farm woodland. Improved practices and coordinated individual and community efforts will be increasingly essential to the production program as demands for wood products increase.

On Federal lands, forest management and protection programs must be accelerated. Work is needed for installation of facilities, road build-

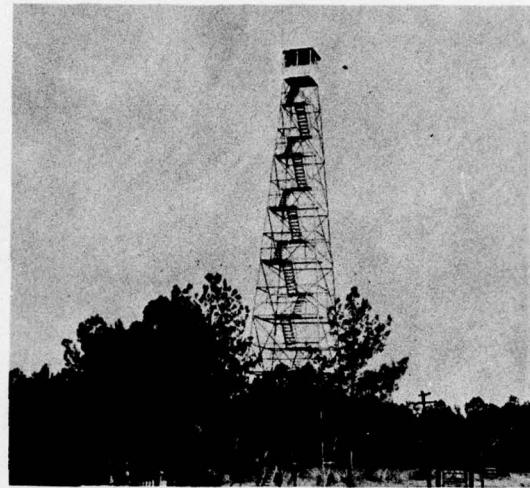


Figure 2.29 *Fire Detection Tower Protects Both Private and Public Timber.*

ing, planting, and carrying out stand-improvement measures.

A program for private lands for the next 40 years should include: Intensified forest fire protection; strengthening of forest insect and disease detection and control programs; fencing to control woodland grazing; tree planting; erosion control work; site preparation for natural regeneration; commercial and noncommercial timber-stand improvement work, either in conjunction with reforestation or as a separate measure; establishment of shelterbelts; woodland drainage water control management; improved naval-stores practices; more adequate programs for forest credit and insurance; and intensified educational, research, and management assistance programs.

SECTION VIII – FISH AND WILDLIFE

General

Fish and wildlife resources have contributed much toward meeting the needs for food and outdoor recreation of the people residing in and outside the Apalachicola-Chattahoochee-Flint basins. Hunting and fishing constitute a vital part of the lives of the people, and commercial fishing is a source of livelihood to many residents along the coast and near the mouth of the Apalachicola River.

Primary responsibility for administering the

fish and wildlife resources resides with the game and fish departments of Georgia, Florida, and Alabama. Federal agencies cooperating with the State conservation agencies in the advancement of conservation programs include the Department of Agriculture, Department of Defense, and the Department of Interior.

Existing Facilities and Programs

Wildlife and Sport Fisheries

The land and water of the basins are well



Figure 2.30 *Open Spaces in Timber Areas Enhance Game Habitat.*

adapted to the production of a variety of wildlife.

About 7.7 million acres of land are considered suitable for big game. This includes all the predominantly forested land and about one-half of the woodlands interspersed by cleared land. White-tailed deer and turkeys occupy about 4.4 million acres or about 57 percent of the total habitat. There are about 36,000 big game animals in the basins or an average of one per 215 acres of suitable habitat.

Small game habitat totaling approximately 12 million acres is composed of the forests, woodlands interspersed with cleared land, and marshlands. The principal species inhabiting the uplands are bobwhite quail, mourning doves, squirrels, and rabbits. Rails are the dominant game species of the coastal marshes.

Of the 491,000 acres of waterfowl habitat, 4,200 acres are of high value for waterfowl. About 12,000 ducks and geese were observed during the 1960 midwinter inventory. The majority were observed in Apalachicola Bay and in

the open waters of the sea near St. George Island. Lake Seminole was the second most important area of waterfowl concentration. The total waterfowl population during the autumn migration is estimated to be 50,000 birds, chiefly gadwalls, redheads, scaups, ringnecks, mallards, black ducks, and coots.

Publicly managed wildlife areas of major importance total over 448,000 acres. The Apalachicola National Forest in Florida and the Chattahoochee National Forest in Georgia are the largest tracts of land within the basins in which wildlife resources are managed for public use. Fort Benning in Georgia is another large area. The Bureau of Sport Fisheries and Wildlife is planning the development of additional acreages for waterfowl management purposes at the Walter F. George Dam and Reservoir project. The State of Georgia manages three additional wildlife areas situated on Federal lands. The State of Florida manages three areas. Two of these are on federally owned lands, and one is on privately owned lands. The State of Alabama man-

FISH AND WILDLIFE 1960

- 1 CHESTATEE WILDLIFE MANAGEMENT AREA
- 2 CHATTAHOOCHEE WILDLIFE MANAGEMENT AREA
- 3 CHATTAHOOCHEE NATIONAL FOREST
- 4 LAKE SIDNEY LANIER
- 5 CHAMBERS COUNTY LAKE
- 6 WARM SPRINGS NATIONAL FISH HATCHERY
- 7 FORT BENNING WILDLIFE MANAGEMENT AREA
- 8 BARBOUR COUNTY WILDLIFE MANAGEMENT AREA
- 9 WALTER F. GEORGE RESERVOIR
- 10 STEVE COCKE STATE FISH HATCHERY
- 11 LAKE SEMINOLE WILDLIFE MANAGEMENT AREA
- 12 MERRITTS MILL POND
- 13 JIM WOODRUFF RESERVOIR
- 14 APALACHEE WILDLIFE MANAGEMENT AREA
- 15 OCHESEE POND
- 16 GASKIN WILDLIFE MANAGEMENT AREA
- 17 APALACHICOLA NATIONAL FOREST
- 18 LIBERTY WILDLIFE MANAGEMENT AREA
- 19 DEAD LAKE
- 20 LAKE WIMICO

WILDLIFE COVER PATTERN

- [Solid gray box] MORE THAN 75% FORESTED
- [White box] 25-75% FORESTED
- [Dotted gray box] LESS THAN 25% FORESTED

- [Line with arrow] COMMERCIAL FISHERY RESEARCH STATION
- [Diamond] COMMERCIAL FISHERY
- [Diamond with circle] WILDLIFE MANAGEMENT AREA
- [Diamond with circle and dot] FISH HATCHERY

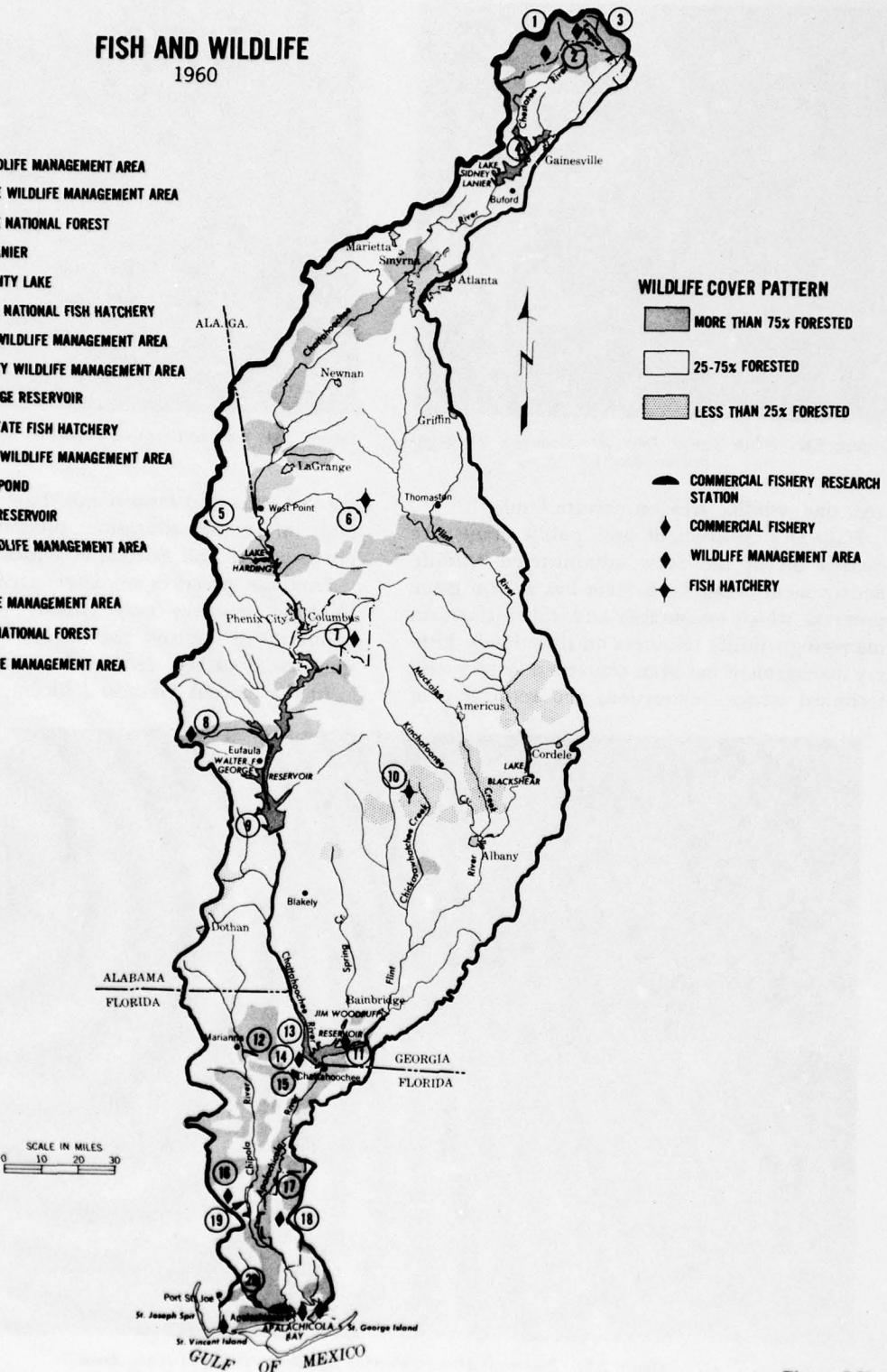


Figure 2.31



Figure 2.32 *White-Tailed Deer Are Common Throughout the Basins.*



Figure 2.33 *Cooper Creek—A Mountain Stream in North Georgia.*

ages one wildlife area on private land.

Habitat improvement and public hunts are carried on in the State administered wildlife management areas. Each State has a farm game program which encourages and aids farmers in managing wildlife resources on their lands. Fishery management has been concerned largely with technical advice, renovation, and restocking of

natural lakes and farm ponds. Law enforcement and information-education programs are important State and Federal activities.

Land-use practices on large privately owned hunting preserves near Albany are designed primarily to improve the habitat for bobwhite quail, wild turkey, deer, and mourning doves.

In the Coastal Plain and Piedmont provinces



Figure 2.34 *Piedmont Streams Provide Excellent Fishing in Many Areas.*

TABLE 2.15
Fresh-Water Fish and Wildlife Areas and Installations

Unit	Administering agency	Acreage ¹
Federal		
Warm Springs National Fish Hatchery, Ga.	U. S. Department of Interior	2
Apalachicola National Forest, Fla.	U. S. Department of Agriculture	113,000
Chattahoochee National Forest, Ga.	U. S. Department of Agriculture	95,000
Fort Benning, Ga.	U. S. Army	182,000
Lake Sidney Lanier	Corps of Engineers, U. S. Army	56,000
Walter F. George Reservoir	Corps of Engineers, U. S. Army	48,000
Lake Seminole	Corps of Engineers, U. S. Army	53,000
Subtotal		547,000
State		
Chestatee Wildlife Management Area	State of Georgia	(25,000)
Chattahoochee Wildlife Management Area	State of Georgia	(35,000)
Lake Seminole Wildlife Management Area	State of Georgia	(4,000)
Barbour County Wildlife Management Area	State of Alabama	14,000
Liberty Wildlife Management Area	State of Florida	(68,000)
Apalachee Wildlife Management Area	State of Florida	(7,000)
Gaskin Wildlife Management Area	State of Florida	28,000
Steve Coeke State Fish Hatchery	State of Georgia	2
Barbour County Lake	State of Alabama	2
Chambers County Lake	State of Alabama	2
Merritts Mill Pond	State of Alabama	2
Subtotal		(139,000)
Total		589,000

NOTES: ¹ Acreage in parentheses included in federally administered lands.

² Less than 1,000 acres.

about 1,100 miles of selected streams with a surface area of about 26,000 acres were evaluated for sport fishing. In addition, 140 miles of cold water tributaries within the Blue Ridge province and 30 miles of cold waters in the Chattahoochee River downstream from Buford Dam were considered to be particularly important.

The clear turbulent mountain streams provide excellent sport fishing. The Chattahoochee and Chestatee River headwaters, Soque River, and Dukes, Smith, Dicks, Waters, and Boggs Creeks are valuable for maintaining a trout fishery of regional importance. Brook, rainbow, and brown trout are the game species.

From the high valleys the mountain streams flow over falls into canyons strewn with boulders. Downstream these rivers offer excellent float fishing. As the streams enter the foothills the water temperatures rise, the gradients flatten, and trout are replaced by redeye bass, small-mouth bass, and red-breasted sunfish. The stream value for sport fishing generally diminishes

downstream as turbidity increases. For some distance below the large impoundments, the sport fishing value of the Chattahoochee River has been greatly improved by reduction of turbidity



Figure 2.35 *Fishing Camp and Boat Ramp on Chipola River, a Coastal Plain Stream in Florida.*

and increased minimum flows. Near Atlanta the stream has been impaired by industrial and domestic pollution.

Spring-fed Chipola River in Florida and Spring Creek in the Coastal Plain of Georgia provide excellent sport fishing for channel catfish, crappies, and other sunfishes.

There will be 17 large impoundments on the main streams with a total surface area of about 136,000 acres after the completion of the Walter F. George and Columbia Reservoirs. Sport fishing is popular on these reservoirs. Lake Wimico, Dead Lake, Ocheesee Pond, and Merritts Mill Pond in Florida total about 11,000 acres. All offer excellent sport fishing.

There are over 25,000 surface acres of farm ponds. Other small impoundments include natural lakes and ponds of less than 40 acres in the river flood plains and numerous sinkholes in areas of the basins underlain by limestone. The natural lakes are unusually productive and, when accessible to anglers, are heavily utilized. The principal game fishes of the impounded waters are largemouth black bass, bluegills, crappies, and other sunfishes.

Fishery management has been concerned largely with technical advice, renovating, and restocking of natural lakes and farm ponds. Game fish, for stocking purposes, are produced in three hatcheries, one State and two Federal. Two of these, one State and one Federal, are located within the basins.

The 60-mile long coastline includes the outer shores of St. George and St. Vincent Islands and St. Joseph Spit. Inshore waters and wetlands include Apalachicola Bay, St. Vincent Sound, Indian Lagoon, East Bay, portions of St. Joseph Bay and St. George Sound, the marshlands, tidal rivers, creeks, and bayous. All produce a variety of marine and fresh-water fishes having sport and commercial value. The surface area of inshore waters totals approximately 120,000 acres. Fishing activity also involves an offshore area of about 375,000 acres.

Principal fishes taken inshore include the spotted sea trout, redfish, sheepshead, striped bass or rockfish, whiting, croakers, pinfish, flounders, pompano, and several lesser bottom fishes. Pompano, jack crevalle, bluefish, and Spanish mackerel are taken in the vicinity of Indian Pass and from the jetties of Bob Sikes Channel. Offshore,

the principal species include sea bass, Spanish and king mackerels, bluefish, cobia, snappers, and groupers. Less frequently caught are amberjack, barracuda, sailfish, and dolphin. Service industries associated with sport fishing and allied outdoor recreation include marinas, boating clubs, fishing camps, cafes, and supply stores.

Commercial Fisheries

Commercial fishing is an important coastal enterprise. The annual commercial fishing catch from 1955 to 1959 averaged 14 million pounds with a value of over \$1 million to the fishermen. Fish caught directly for food composed 57 percent of the weight and about 93 percent of the value of the total landings. Shrimp, crabs, and oysters were the principal shellfishes; and mullet, red snapper, and groupers were the principal finfishes. In addition, there was a relatively small yield of catfish from inland fresh waters. A portion of the total commercial catch is consumed locally; the bulk is processed and marketed throughout the eastern United States.

Apalachicola is the recognized oyster capital of Florida. Approximately 70 percent of the total production of the State is harvested from the bay. Some 47 shore establishments in the basins handled or processed the commercial catch.

The Florida fisheries, both sport and commercial, are administered by the Florida State Board of Conservation with the assistance of the U. S. Fish and Wildlife Service. There are numerous programs in the region for research, development, and service of the commercial fisheries, although few are headquartered in the basins. The Oceanographic Institute of Florida State University is engaged in various studies of marine fishes, with particular emphasis on the cultivation of the hardshell clam or quahaug. Oyster investigations are being conducted in the vicinity by both the main laboratories of the Florida State Board of Conservation and the Bureau of Commercial Fisheries at nearby Gulf Breeze, Florida. Technological services directed toward development of new markets for fishery products are provided by the Bureau's research station in Pascagoula, Mississippi. The Bureau of Commercial Fisheries furnishes market news service and assists the industry with loans to qualified fishermen.

Needs and Opportunities

Wildlife and Sport Fisheries

In 1960, hunting and fishing afforded over 3 million user-days of outdoor recreation. About 0.9 million user-days of demand for fishing remained unsatisfied. By 2000, the user-days of hunting and sport fishing are expected to increase to about 11.7 million user-days.

The total population increase and trend toward urbanization were decisive factors influencing estimates of total hunting and fishing demand. Comparative studies of hunting and fishing license sales revealed that per capita demand decreases as urbanization increases. In spite of the expected decline in per capita demand after 1975, caused by a further decrease in rural population with a rapid expansion of urban populations in Atlanta, Columbus, Albany, and other cities, the net effect will be a significant increase in hunting and fishing demand.

Use of publicly owned and managed areas will continue to increase at a rate greater than the general increase in population and overall hunting and fishing effort. This, too, reflects the impact of urbanization. Closure of more private lands to public use will make it increasingly difficult for the urbanite to find a place to hunt, despite increases in travel, leisure time, and personal income.

Analysis of needs for hunting opportunity in relation to existing and prospective resource



Figure 2.36 Wild Turkeys Are Considered the Most Challenging Game by Many Hunters.

supplies led to the establishment of goals which place greater emphasis on big game production and utilization in the future. With normal expansion of going programs there will be adequate numbers of big game to satisfy the needs through 1975, but less than the number needed by 2000. However, with management of all suitable habitat at a high level, the potential big game crop would be more than ample to meet the need for this type hunting.

Small game resources are expected to continue to support the majority of the hunting pressure. In establishing future goals, it was recognized that the supply and availability of small game

TABLE 2.16
Wildlife Needs and Supplies
(thousands)

Year	Type of resource	Need User-days	Supply Acres of habitat	Supply User-days capacity*	Deficit User-days
1960	Big game	158	7,739	180	0
	Small game	898	12,229	1,172	0
	Waterfowl	17	491	17	0
1975	Big game	394	8,843	420	0
	Small game	1,299	11,987	1,154	45
	Waterfowl	19	491	17	2
2000	Big game	509	8,843	500	9
	Small game	1,765	11,120	1,071	694
	Waterfowl	20	491	17	3

* Based on existing and prospective numbers of game animals, with normal expansion of going programs.



Figure 2.37 *Bream Fishing—Florida—In a Typical Coastal Plain Environment.*

TABLE 2.17
Sport Fishing Needs and Supplies
(thousands)

Year	Type of resource	Need User- days	Supply		Deficit User-days
			Acres of habitat	User-days capacity*	
1960	Streams, cold water	19	—	16	3
	Streams, warm water	268	27	540	0
	Large impoundments	990	75	750	240
	Small impoundments	1,526	27	895	631
	Salt water	105	495	1,980	0
1975	Streams, cold water	43	—	16	27
	Streams, warm water	325	23	460	0
	Large impoundments	2,122	159	1,590	532
	Small impoundments	2,599	43	1,455	1,144
	Salt water	273	495	1,980	0
2000	Streams, cold water	98	—	16	82
	Streams, warm water	460	23	460	0
	Large impoundments	4,623	159	1,590	3,033
	Small impoundments	3,902	64	2,190	1,712
	Salt water	337	495	1,980	0

* Based on existing and prospective standing crop of game fish with normal expansion of going programs.

will become critical. Although it will not be economically feasible to increase substantially the total numbers of small game over the basins as a whole, practices have been developed and are being effectively applied in local areas to increase natural quail production. However, costs of such management have prohibited extensive application.

Waterfowl hunting is confined largely to the coastal marshes and lowlands of the Apalachicola River and tributaries. This resource cannot be expected to sustain much increase in hunting pressure because of the poor prospects for increasing the waterfowl population.

An analysis of the needs and desires for sport fishing in relation to resource trends and development opportunities led to the establishment of goals which will require an increase in the user-day capacity of all types of fresh waters.

With greatly increased demand for trout fishing in cold water streams, it is expected that use of this resource will increase almost five times by 2000 if the opportunity is provided. Use of warm water streams would be doubled. Greater emphasis would be given to large impoundment fishing in view of its attraction to urban residents and the opportunity for reservoir development. Small impoundments would continue to satisfy a large portion of the total fishing pressure.

Salt-water fishing is expected to increase at least three times over present use in response to the growing popularity of this sport. The sea is capable of producing many more pounds of fish than required.

Commercial Fisheries

The demand for fish landed at ports in the basins is expected to increase to 18.4 million pounds by 1975 and 29.7 million pounds by 2000. The average annual catch from 1955-59 is considered to be the basins current share of the United States market. The projected catch reflects the pounds of fish which must be caught to meet the basins share of the United States market in 1975 and 2000.

In making these projections, it was recognized that food fish production in the United States has declined since 1950, while food fish imports have steadily increased. Factors responsible for

this decline are fluctuations in supply, increased costs, competition from other animal protein foods and foreign fishery products, and insufficient information about the sea and its resources. The per capita consumption of food fish, about 11 pounds annually, has remained constant.

The catch of selected food fish landed at docks in the basins has been relatively stable since 1930 despite an increase in the number of fishermen and fishing craft. The shrimp fishery was expanded in the early 1940's in response to increased demand, coupled with improved techniques of processing and marketing. With full utilization of known supplies, however, further expansion of this industry ceased. Oyster production, which reached its zenith in the early 1900's when there was an abundance of oysters and a demand for canned products, declined to a low in 1959 and has increased since then.

The demand for quality seafood, however, is high and is expected to continue increasing in the future. To meet this demand, it is feasible to augment natural production of shrimp, oysters, and certain finfishes by cultural programs. As for other fishes, there seems to be ample supplies and a potential market if food products can be produced that will meet with wide public acceptance.

Under these conditions, it was assumed that domestic production in the future will keep pace with the national population increase.

These and other considerations led to the establishment of production goals, by type of resource, for 1975 and 2000.

TABLE 2.18
Commercial Catch Requirements
(thousands of pounds)

Resource	1960*	1975	2000
Food			
Selected finfish	2,705	2,895	3,340
Shrimp	1,090	1,125	1,250
Crabs	1,200	1,750	2,700
Oysters	950	1,580	5,263
Other	935	1,630	1,967
Subtotal	6,880	8,980	14,520
Other	7,200	9,400	15,200
Total	14,080	18,380	29,720

* Based on average annual catch, 1955-59.

Means of Meeting the Needs

With more intensive management and increased availability of fish and wildlife resources, the demand for food and for hunting and sport fishing can be met. However, some adjustment in wildlife and fish inventories and in sportsmen's preferences will have to be made.

Wildlife and Sport Fisheries

Big game development is one of the most promising ways to meet the future hunting demand. With more extensive management, the habitat has the capability of readily supplying the expected big game demand, plus a considerable amount of the unsatisfied demand for small game and waterfowl hunting. Some loss of habitat is expected through urban loss and industrial development. However, this will be generally offset by conversion of other lands to forests. Some forestry practices, such as destruction of hardwoods, planting of solid pine stands, and draining and clearing mixed forest land, tend to reduce the carrying capacity to a considerable degree. Further cooperation on the part of forestry interests in wildlife management practices, however, may be expected with continued emphasis on programs involving private landowners, conservation agencies, and the sportsman. Greater emphasis on hardwood production in the future is also expected to reverse present trends and thereby favor wildlife production.

To meet the demand for big game hunting,



Figure 2.38 Bear Cubs Attract Sightseers as Well as Sportsmen.

an inventory of around 100,000 head of game will be needed by 2000. This amounts to an increase of 64,000 animals. Current programs will have to be accelerated and additional wildlife areas established to meet the requirement.

The existing and proposed wildlife management areas should be improved by the State game and fish departments in cooperation with the landowners, generally in accordance with the type of programs now in effect. The coordinated approach to timber-wildlife management as practiced on the national forests should be applied on a much larger scale. The continued improvement of wildlife habitat, with provision for public use on military areas as now in progress, should be encouraged.

The task of developing small game resources to meet future demands lies primarily with the landowners. Bobwhite quail and mourning doves, the most popular game species in the basins, are largely the product of the type and pattern of land use. Agricultural practices which provide food and cover for wildlife should be encouraged. Prescribed burning, roadside planting, and establishment of food and cover strips should be employed more extensively by owners of commercial forests in the coastal flatwoods. Emphasis should be given to this type of program on all lands within the existing and proposed management areas and to maintaining these areas open to public hunting. Fields need to be developed by State and local interests for dove hunting purposes by employing management practices.

The duck population trend in the Atlantic and Mississippi Flyways, after remaining essentially static for several years, has resumed a gradual decline. However, the waterfowl value of the basins wetlands can be enhanced by habitat improvement in conjunction with other water developments including farm pond and small watershed programs.

The waterfowl potentials of Apalachicola Bay wetlands could be improved by a program designed to increase the supply and availability of waterfowl food. Development of green-tree reservoirs and dewatering projects in the flood plains of streams in the Upper Coastal Plain and middle Piedmont hold considerable promise. The authorized national wildlife refuge on Walter F. George Reservoir should contribute much

toward increasing the number of ducks and geese locally.

The establishment of regulated shooting preserves by local interests for small game and waterfowl hunting would be beneficial.

A balanced program of stream and lake improvement and development is needed to meet present and future needs.

If the present trend in farm pond construction continues and fishery management is intensified, there will be ample number and acreage of small impoundments to meet the demand for this type fishing. A greater percentage of the ponds needs to be constructed nearer population centers. Expansion of the current fisheries program will be needed to service these and other impoundments to increase the average production of fish per acre and the quality of fishing.

Sport fishing pressure on some existing large impoundments in the basins is relatively light. Greater demand and more intensive fishing pressure, however, is expected with increased human populations and accelerated fishery management programs. A minimum of 462,000 additional acres of large impoundments, with management at a low to medium level, would be required to produce the weight of fish necessary to satisfy the expected fishing pressure. As an alternative program, a minimum of 40,000 acres of additional large impoundments, with management at a high level, would suffice.

Realization of the full potentials of the streams will require pollution abatement, increased fish production, and regulation of low flows to prolong favorable fishing conditions. Regulated streamflow, coupled with sewage treatment and proper disposal of industrial wastes, would also abate pollution problems and enhance the stream values. Existing programs of access development will have to be greatly expanded. Minimum facilities at each site include a parking area and a concrete boat-launching ramp. Camping facilities at a number of the sites would further increase their utility. The current trout stocking programs will have to be expanded.

Meeting salt-water fishing needs will require further development of facilities, services, and accommodations. The marine waters are capable of producing more than the amount of fish needed to meet the projected requirements, but

fish and fishermen must be brought together. Facilities for salt-water sport fishing are developed in the immediate vicinity of Apalachicola, but there is need and opportunity for further expansion along the coast. Stretches of the sea-coast are without public access. Additional access is needed to reduce travel distances and congestion at some existing access sites. More fishing piers are needed. Many bridges which cross bays and inlets, if equipped with catwalks, would provide fishing opportunities. Jetties and breakwater structures could serve more people if equipped with walkways and handrails.

For maximum benefit, all highways, landfills, canals, and other water developments must be designed to safeguard and possibly enhance the productivity of the coastal waters. More information concerning fishing waters is needed to disperse the fishing effort.

Appropriately marked, sunken artificial fishing reefs would localize marine fish populations for easy location by sport fishermen. Such a program is rapidly gaining momentum and offers one of the best and most economical means of improving the catch in the open sea.

Preserving and developing the trout streams in the Chattahoochee River headwaters require public action so that greater use of these natural resources will be obtained without impairing their natural attractiveness. Public acquisition and administration of the lands and waters within designated areas are desirable to insure development along a natural theme.



Figure 2.39 Bass Fishing Is Popular in All of the Basins Large Water Bodies.

More intensive development of wildlife resources for public hunting and fishing and preservation of the wilderness features of the lower Apalachicola River flood plain could best be accomplished by leasing large tracts by the conservation agencies.

Commercial Fisheries

The existing fishing fleet is adequate to harvest many more pounds of fish from the sea, if new sources of the more heavily utilized fishes could be found and the market increased for other fishes which are more abundant. Improved gear will be required and operations will have to be expanded.

Oyster production could be increased from three to four times with proper management, enforcement, and cultivation practices. Surveys reveal that, in the shallow inshore waters of the basins, there are about 7,000 acres of oyster reefs, of which more than 4,000 acres have been depleted. In addition, there are many acres of bottoms which could be put into oyster production with establishment of cultch and control of pollution now affecting some 21,000 acres within Apalachicola Bay.

Known shrimp resources are fully utilized at present. The catch along the Gulf coast has not increased in recent years, despite a marked increase in fishing pressure. More extensive knowl-

edge is needed concerning the biology of the shrimp and the effects of fishing on the shrimp population. New sources of supply need to be discovered.

The crab fishery offers one of the most favorable means to meet the requirements for shellfishes. Crabs are abundant in the coastal waters of the basins and have a steadily growing market.

The catch of finfish could be expanded to meet established goals. Methods of handling and processing such fish as mullet and speckled trout must first be improved, however, to create quality products that will compete with seafoods from other areas. With improved gear and methods of fishing, the yield per unit of effort can be increased and operations expanded at reasonable cost.

The shallow inshore waters of the basins have great potentials for seafood culture. Despite the productivity of the seas, it will become increasingly difficult to harvest the wild crop at costs which will enable the industry to compete with foreign imports and the mass production and marketing methods of the meat and poultry industries. Results thus far achieved through experimental pond culture of shrimp and pompano, however, provide sufficient basis for the initiation of experimental management programs. Extensive application may be expected after practical demonstrations of this technology.

SECTION IX - RECREATION

General

Natural recreation resources of the Apalachicola-Chattahoochee-Flint basins include the Blue Ridge Mountains in the extreme north, the man-made lakes, the rivers, and the seacoast. These areas offer opportunities for a wide variety of recreation activities. Twelve State parks, two national forests, Lake Sidney Lanier and Lake Seminole, and many historic monuments and private developments have made the basins a *major recreation area*. The concentration of population around Atlanta and Columbus, Georgia, have reflected the growing demands of urban residents for public outdoor recreation. The outstanding example of Lake Sidney Lanier in meeting present needs is an important example of recent development. The basins are endowed

with natural features of regional importance. The development of the Callaway Gardens at Pine Mountain, Georgia, is an excellent example of the adaptation of a natural area to recreation opportunity. The basins have innumerable land and water resources which can be adapted to meet recreation needs by supplying recreation facilities for large numbers of people.

Existing Facilities and Programs

In 1959, visitation at public recreation areas within the basins totaled over 13 million user-days. Some areas are not sufficiently utilized and others are over-utilized. Lake Sidney Lanier accounted for over one-half of the estimated visitation in the basins.

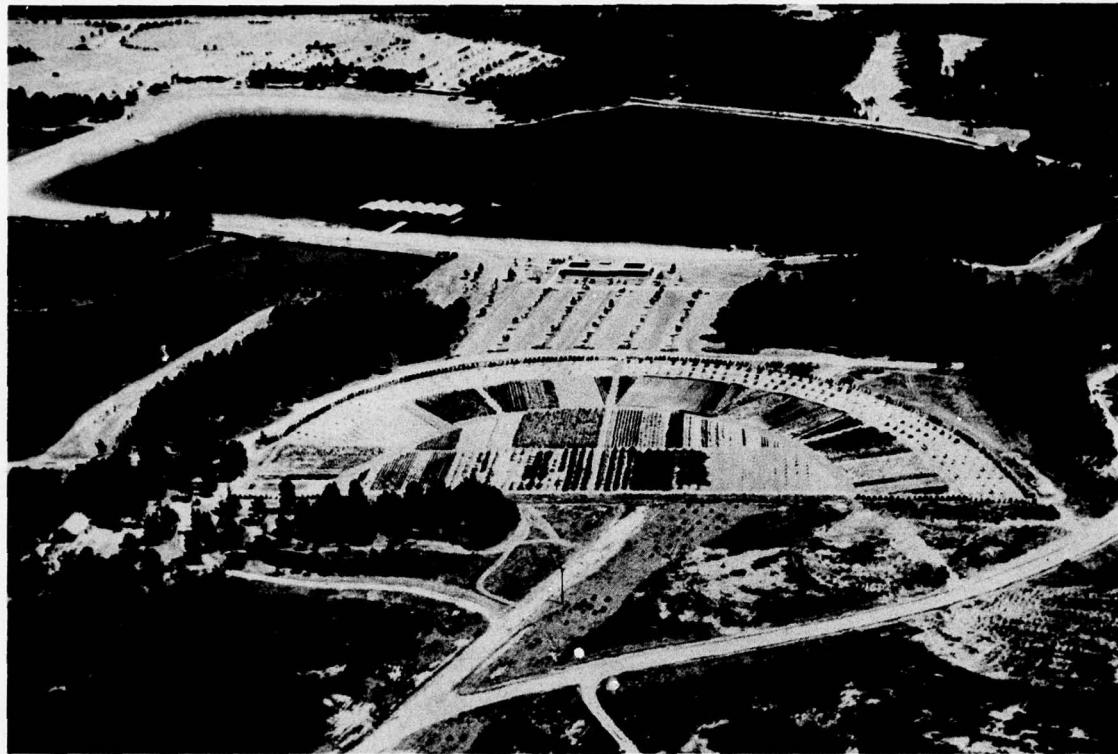


Figure 2.40 Callaway Gardens, a Privately Owned Recreation and Cultural Area, Operated for Public Use, near Pine Mountain, Georgia.

Beaches west of Apalachicola, Florida, have not been extensively developed for mass use, although several areas from Port St. Joe eastward along the Gulf coast accounted for about 100,000 user-days in 1959. St. Joseph Spit is now generally inaccessible to the public.

Radium Springs, outside of Albany, and several State parks, especially Chehaw State Park and Senoia State Park, have been developed as high-density use areas with facilities for swimming and picnicking. Other high-density use areas are part of larger complexes. For example, there are three State parks located on Lake Seminole.

Chattahoochee State Park is a 596-acre recreation area in Houston County, Alabama, on the Chattahoochee River.

Florida Caverns State Park is a 1,063-acre park near Marianna, Florida. Recreation facilities are centered around the limestone caverns and offer a wide range of outdoor recreation activities.

Franklin D. Roosevelt State Park is a 5,063-acre park in Harris County, Georgia, near Pine

Mountain. Facilities are available for camping, picnicking, swimming, boating, and hiking. Located on a ridge near Callaway Gardens, this recreation area is within easy driving distance of Columbus and Atlanta.

Georgia Veterans Memorial State Park is a 1,307-acre park on Lake Blackshear west of Cordele, Georgia. Facilities are available for camping, boating, swimming, and picnicking.

Kolomoki Mounds is a 1,283-acre State park in Early County, Georgia, centered around archeological features. Facilities are available for picnicking, sightseeing, camping, swimming, and boating.

Unicoi State Park is a 323-acre area in White County, Georgia, on the southern slopes of the Blue Ridge Mountains. Facilities are available for camping, picnicking, hiking, swimming, and boating.

Torreya State Park is a 1,063-acre park in Liberty County, Florida, on the Apalachicola River.



Figure 2.41

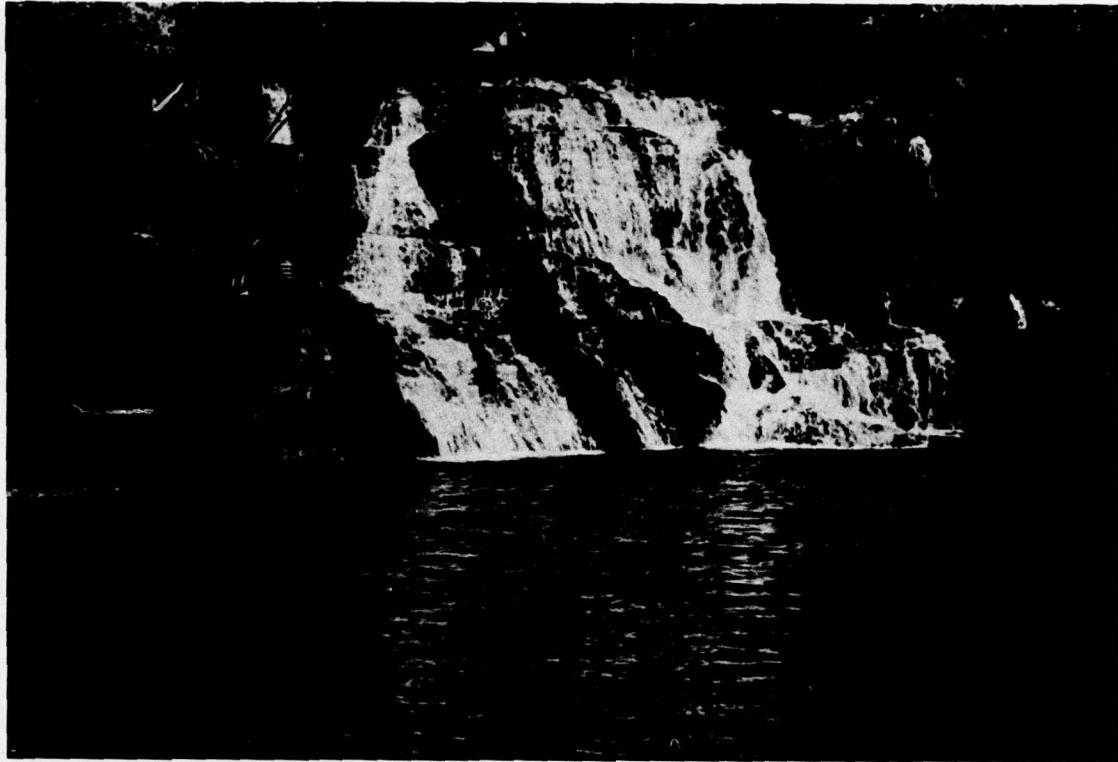


Figure 2.42 *The Basins Have Many Natural Attractions Like this Waterfall in North Georgia.*

Apalachicola National Forest is in Liberty and Franklin Counties, Florida. About 112,600 acres of the forest are in the Apalachicola-Chattahoochee-Flint basins. Little recreation development has occurred but the area is used for hiking, camping, picnicking, nature study, and similar activities.

Chattahoochee National Forest in north Georgia has 95,400 acres within the Apalachicola-Chattahoochee-Flint basins. Recreation use in 1960 totaled approximately 125,000 user-days, centered on about 85 acres in six developed areas. The entire area is used for dispersed, family-type recreation.

Lake Sidney Lanier is a 55,700-acre lake on the upper Chattahoochee River formed by Buford Dam about 40 miles northeast of Atlanta. Completed by the Corps of Engineers in 1957, the area has been undergoing rapid development with State and local agencies and groups constructing areas suitable for outdoor recreation use. Over 5 million user-days were accounted for by this lake in 1960.

Jim Woodruff Reservoir is a 37,500-acre lake resulting from impoundment of the Apalachicola River at the confluence of the Chattahoochee and Flint Rivers near Chattahoochee, Florida. Jim Woodruff, Chattahoochee, and Bainbridge State Parks are located on the reservoir.

Constitution Convention Historic Memorial is a museum at Port St. Joe, Florida, on the site



Figure 2.43 *Youth Are Major Users of Public Parks.*



Figure 2.44 *Marina at Lake Sidney Lanier Serves Many of the Thousands Who Seek Recreation Benefits of Water Sports.*

of the convention which drafted the State Constitution in 1838. Some facilities exist for picnicking and sightseeing.

Dr. John Gorrie Historic Memorial is a museum and monument at Apalachicola, Florida, honoring the inventor of artificial refrigeration. Facilities are for sightseers.

The Gold Museum at Dahlonega, Georgia, is the historic center of the North Georgia gold mining industry before the Civil War.

The Confederate Naval Museum, being developed at Columbus, Georgia, commemorates naval activities of the Civil War era.

Kennesaw Mountain National Battlefield Park includes 3,084 acres near Marietta, Georgia, commemorating the site on which one of the major defenses of Atlanta took place in 1864. The park offers conducted tours and contains a visitors center.

The Little White House at Warm Springs, Georgia, is where President Franklin D. Roosevelt died in 1945. Visitation to the site is in-

creasing. A museum and facilities for the sightseer and picnicker are available.

Warm Springs National Fish Hatchery is located just south of the town of Warm Springs, Georgia.

Needs and Opportunities

In estimating future recreation demands, it was assumed that the residents of the Southeast River Basins who leave the area primarily for recreation purposes are about equal to the non-residents who visit the area for recreation. However, many recreationists pass through the basins and about 60 percent of these seek some type of outdoor recreation. The basins have excellent land and water resources for attracting recreation-seeking people. It was also assumed that approximately one-fifth of the leisure days available to the people of the basins would be accounted for in some way or another at public outdoor recreation areas. It was further assumed that the availability of good public recreational

TABLE 2.19
Recreation User-Days—1960, 1975, and 2000
(thousands)

Area	1960	Projected need	
		1975	2000
Apalachicola-Chattahoochee-Flint basins	13,100	25,800	58,000
Southeast River Basins	35,000	95,000	230,000

TABLE 2.20
Recreation Facility Needs
(thousands of user-days)

Facilities	1960	Increase 1960-1975	Increase 1975-2000	2000
Enlarging existing areas	13,135	1,140	11,645	25,920
New areas	—	11,525	20,555	32,080
Total	13,135	12,665	32,200	58,000

facilities would be a factor in attracting new residents to the area.

Urbanization trends in the Southeast River Basins closely follow national trends. While the urban population of the A-C-F basins amounted to only 36 percent of the total in 1930 and 60 percent in 1960, it is expected to be over 80 percent of the population by the year 2000. Residents are expected to require more opportunity than will be available in the basins by the year 2000. Facilities and areas are estimated to meet the needs for 58 million user-days and many residents will seek outdoor recreation in the other major river basins of the Southeast study area. Peak demand will occur in the summer months. Although spring and fall are comfortable for outdoor recreation, the winter weather is not as conducive to extensive outdoor recreation.

New reservoirs, some near the larger population centers, could provide choice areas for outdoor recreation. Facilities at existing areas could be expanded. Many miles of little used white sand beaches front the undeveloped barrier islands on the Gulf of Mexico. These beaches could be made available for the enjoyment of many visitors. For the future, sand dunes should be preserved, and erosion should be controlled. As the islands are developed, evacuation routes should be provided and hurricane plans prepared.

The early history of the basins has been somewhat overlooked. The outstanding Indian tribes; the Spanish with their explorations, missions, and trails; the British and French; and the traders and pioneers of long ago have not received the cultural attention and appreciation they deserve. Many historic and archeologic sites could be acquired and preserved until final development is possible.

Means of Meeting the Needs

To satisfy resident needs within the limitations of resource availability and provide for nonresident requirements, outdoor recreation facilities must be increased to accommodate four times the current user-day participation. In many cases, demands can be satisfied by expanding existing facilities and by emphasizing the development of those resources not currently utilized.

Of the existing recreation areas, those at Jim Woodruff Reservoir and Lake Sidney Lanier will be able to absorb the greatest increase in numbers of visitors. The Blue Ridge with the Chattahoochee National Forest and adjacent areas also offers great opportunities. However, to obtain a dispersed and varied recreation plan, expansion of existing facilities of all the other areas should be vigorously pursued.

By the year 1975, almost 15 million user-days would be accommodated at existing areas, and

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PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOU--ETC(U)
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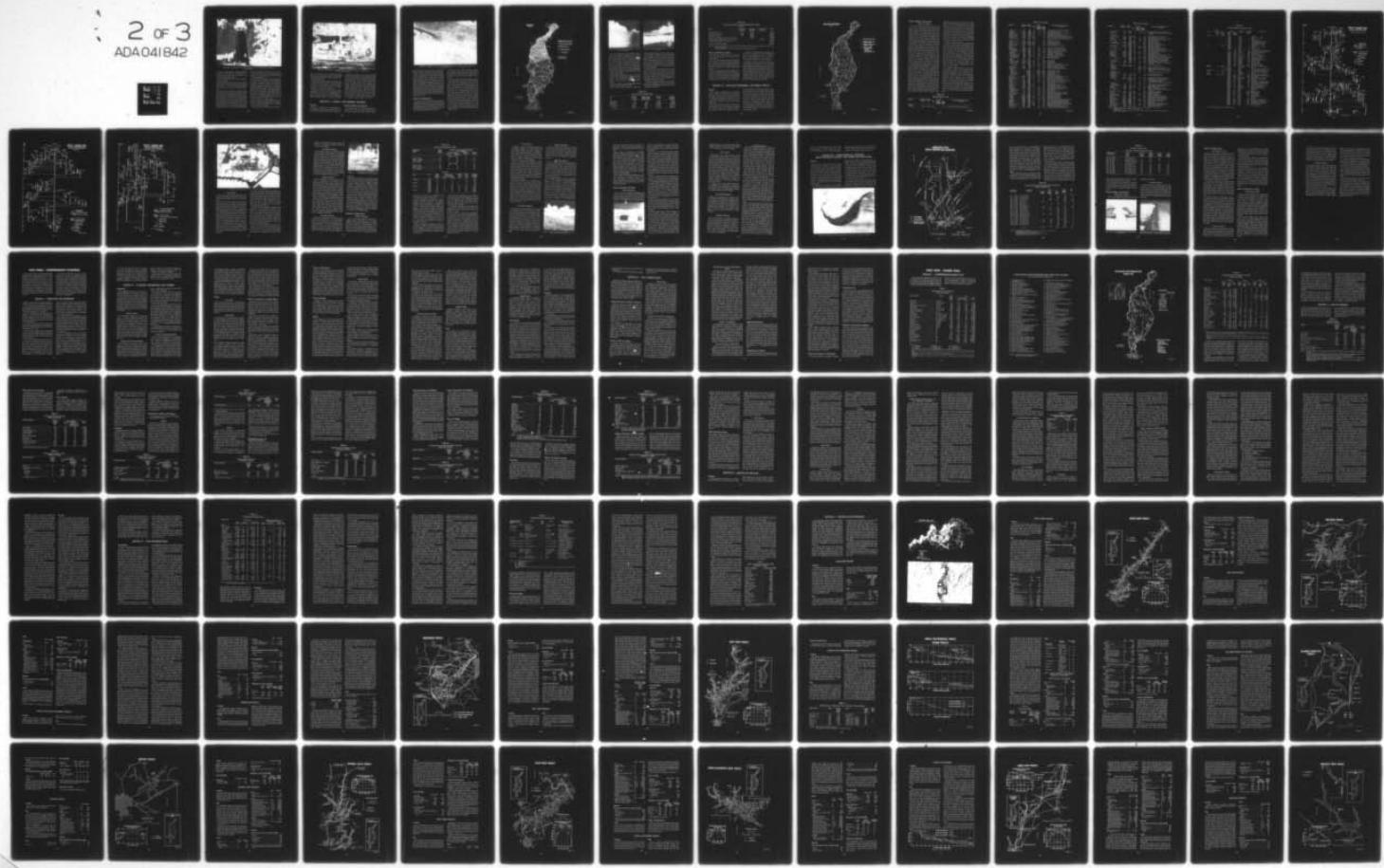




Figure 2.45 *A Lighthouse on the Florida Gulf Coast Is a Tourist Attraction as Well as a Navigation Aid.*

by 2000, use would amount to nearly 26 million. In order to reach the goal of 58 million user-days annually in 2000, new areas must be developed for remaining needs.

New developments would include the following types of areas.

The undeveloped Gulf coast area could be developed to meet the greatly increased demands placed upon it as the more highly developed coastal areas to the west receive more intensive use.

The Atlanta area will have vast needs for high density outdoor recreation areas within easy driving distance. The Chattahoochee River west of Atlanta and the Anneewakee and Dog Rivers area southwest of the city would be desirable locations for mass recreational areas with extensive water-based recreation opportunities. Small impoundments in the Atlanta area could also be used to meet these urgent needs for increased opportunities. Not all small impoundments

would be adaptable, but where they are compatible with other uses, every effort should be made to use their potential to provide public recreation opportunity.

General outdoor recreation areas such as local and State parks could be located throughout the basins to provide outdoor recreational opportunities to urban residents, to nonresidents passing through the basins, and to residents of smaller communities and rural areas. Included should be areas subject to development for a wide variety of uses such as camping, picnicking, boating, and swimming. Access areas sized to meet local conditions ranging from 10 to 75 acres and county and State parks would serve as local and State recreation areas.

The extensive water and woodland areas in the basins would give opportunities to the recreationist who likes boating, hiking, and camping in areas with fewer facilities.

Providence Canyon in Stewart County, Geor-



Figure 2.46 *A Growing Use of Camping Facilities Is Expected to Account for Much Outdoor Recreation in the Future.*

gia, is a colorful canyon, one-half mile long, 300 feet wide, and 150 feet deep. This area could be developed to provide a wide variety of recreational opportunities.

Chipola River flows between Marianna and Dead Lake, Florida, just west of the Apalachicola River. An opportunity exists here to preserve this attractive clear stream in its natural condition as a major recreation area.

Ten sites have been identified with unusual significance as historic or archeological areas. The historic sites are (1) Fort Apalachicola in Russell County, Alabama; (2) Fort Gadsden in Liberty County, Florida; (3) Ruff Creek Mill

near Smyrna, Georgia; (4) Soap Creek Mill northwest of Atlanta in Cobb County, Georgia; and (5) Roswell Mill at Roswell, Georgia. The archeological sites are (1) Aspalaga in Gadsden County, Florida; (2) Cayson in Calhoun and Liberty Counties, Florida; (3) Nacoochee in White County, Georgia; (4) Neisler at Reynolds, Georgia; and (5) Pierce in Franklin County, Florida. Appropriate State and local agencies could develop these areas. In some cases, a small interpretive center would be needed. In others, some restoration may be required. Others could be developed in conjunction with recreation areas offering a greater variety of activities.

SECTION X – SALINITY AND SEDIMENT CONTROL

General

Salinity and sediment are local problems in the Apalachicola-Chattahoochee-Flint basins. Saline soils occur only in the salt-water marsh areas.

Existing Facilities and Programs

No programs exist exclusively for sediment or salinity control. Because of the relatively small percentage of land area involved and the costs

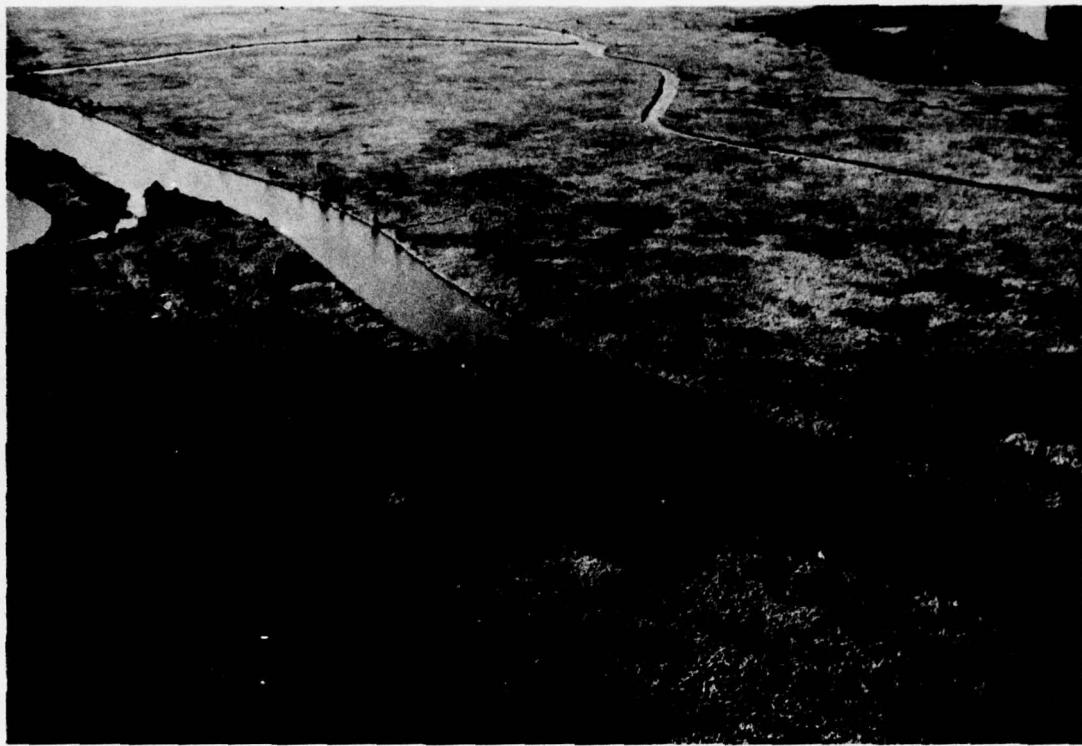


Figure 2.47 Marshlands near Mouth of Apalachicola River Are the Only Extensive Saline Areas in the Basins.

associated with restoration, only a small effort has been made to rehabilitate saline soil areas.

The soil and water conservation program, which is administered by soil conservation districts, includes features which seek to control erosion and hence reduce sediment loads. During the past 20 years, many land owners and operators have applied measures designed for conservation and better utilization of land resources. These measures include vegetative stabilization management practices and grade stabilization structures. These have helped to decrease sediment production rates. Also, a significant amount of sediment is trapped in the thousands of farm ponds in the area.

Needs and Opportunities

Extensive sheet erosion occurs over wide areas and channel erosion occurs in gullies and along roadbanks and streams. More potential sediment producing soils, over 6 million acres, are in the Apalachicola-Chattahoochee-Flint basins than in any of the other basins in the study area.

In terms of total volume, sediment originating from sheet erosion is greater, although sediment produced from other sources may be more per unit area and may occur in higher concentration.

The several dams on the Chattahoochee River cause deposition of sediment and, therefore, greatly alter the sediment characteristics of the river. In the upper reaches of the Chattahoochee River, concentrations of suspended sediment are commonly 2 to 15 parts per million during periods of low to moderate flow and increase with increasing discharge. During periods of high discharge, the concentration may exceed 1,000 parts per million. The annual sediment yield, based upon studies of other mountain streams, probably ranges from 300 to 1,000 tons per square mile. Below Buford Reservoir, the concentration of suspended sediment is 3 to 20 parts per million during low periods and may reach 1,000 parts per million during high discharge periods.

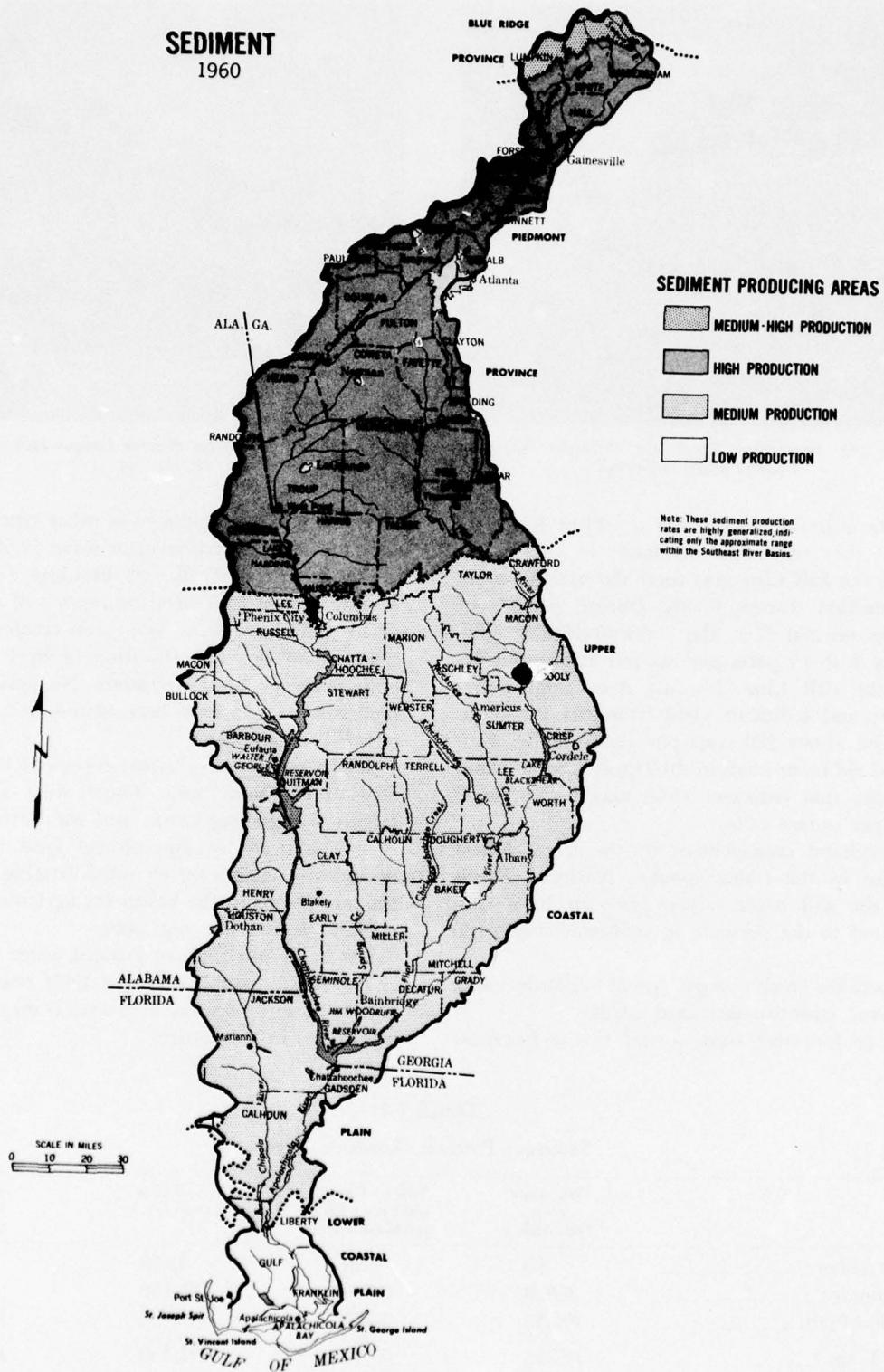


Figure 2.48



Figure 2.49 *Vegetative Treatment Provides Sediment Control Along Highways.*



Figure 2.50 *Salt Marshes Provide Unique Fish and Wildlife Habitat.*

Data available concerning the Flint River indicate that suspended sediment in the waters above the Fall Line may total 550 parts or more per million during floods. During periods of low to normal flow, the concentration is commonly 3 to 15 parts per million above and below the Fall Line. Limited data suggest that the annual sediment yield from the Piedmont may be about 200 tons per square mile. Estimated sediment loads in the Upper Coastal Plain indicate that sediment yield may be 20 to 40 tons per square mile.

Woodland management by the U. S. Forest Service in the Chattahoochee National Forest and the soil conservation program have contributed to the decrease in sediment concentrations.

Roadside erosion occurs predominantly along unpaved county-maintained roads.

More intensive study could reveal instances

in which sediment damages of other types occur.

Saline soils are confined to some 17,600 acres of salt marsh in Gulf and Franklin Counties, Florida. There have been no reports of acreages where saline problems have been created or accelerated by heavy fertilization or by irrigation with saline or brackish waters. No agricultural land is known to have been abandoned because of saline conditions.

Saline soils in the basins represent 0.14 percent of the total area. These areas are used largely for grazing cattle and for native wildlife. The need for agricultural land will not necessitate reclaiming or rehabilitating any of the saline soils in the basins for agricultural use until well after the year 2000.

Salt-water intrusion of ground water supplies is not now a problem in the Gulf coast areas. However, with population growth it may become a problem in the future.

TABLE 2.21
Sediment Problem, Roadside Areas

Area	Drainage area (sq. mile)	Miles of roadside on which problem exists	Soil loss (ton/yr.)	Cost for vegetative treatment
Blue Ridge	80	20	8,000	\$4,000
Piedmont	6,620	2,790	423,150	635,000
Coastal Plain	10,655	3,500	410,000	1,353,000
Total	17,355	6,310	841,150	1,992,000

TABLE 2.22
Average Annual Sediment and Roadbank Erosion Damage
(dollars)

Item	Blue Ridge province	Piedmont province	Coastal Plain province ¹	Total
Flood plain scour	4,000	37,000	---	41,000
Overbank deposition	1,500	102,500	---	104,000
Roadbank erosion	150	39,500	---	39,650
Progressive swamping caused by channel fill	---	69,000	---	69,000
Drainage ditch maintenance due to sediment	---	---	26,000	26,000
Loss of storage capacity in reservoirs ²	---	---	---	18,000
Annual total basins damage	---	---	---	297,650

NOTES: ¹ Sediment damage data are scarce for Coastal Plain. Minor amounts of damage from sediment are indicated for this area of the basins.

² Loss of storage capacity due to sedimentation occurs throughout the basins.

Means of Meeting the Needs

Most sediment control will occur as an incidental effect of programs initiated primarily for other purposes.

Section VI, Soil Conservation and Utilization, lists acreages on which land treatment measures will be required by 2000. Although these measures are not specifically for sediment control, an incidental effect will be to reduce sediment production.

Overall watershed treatment programs, which often include impoundment-type structures, provide the most effective means of establishing sediment control. Individual farm soil and water conservation programs offer the best means for reducing erosion on other lands in the basins.

Treatment and stabilization of eroding roadside areas are estimated to be 80 to 90 percent effective in reducing rates of soil loss. The savings in road maintenance costs would be at least enough to offset the cost of treatment.

Measures for erosion and sediment control on major sediment producing areas can be installed most effectively as integral parts of road and highway improvement programs and as parts of overall watershed-treatment programs. The watershed treatment approach utilizes assistance of local governments and other sources of financial and technical assistance. With the expected new highway construction, roadside erosion control needs probably will be 15 percent greater by 1975 and 25 percent greater by 2000.

SECTION XI – POLLUTION ABATEMENT AND PUBLIC HEALTH

General

Public health is important in the development of resources. Economic growth is retarded when poor health causes a loss in production or necessitates high expenditure for personal medical attention. Programs in this field are concerned with improving the health of the entire population.

Only those phases of public health directly related to land and water resources development are included in this study. Items discussed in this Section include: The abatement of water

and air pollution; radiation monitoring; collection and disposal of community and industrial solid wastes; and vector control. The development and protection of potable water supplies discussed in Section II are also an important part of the public health program. The basic objective of all phases of public health is the protection of community health through the control of man's environment. An adequate co-ordinated public health program is essential for the optimum utilization of land and water resources of the basins.

POLLUTION ABATEMENT

1960

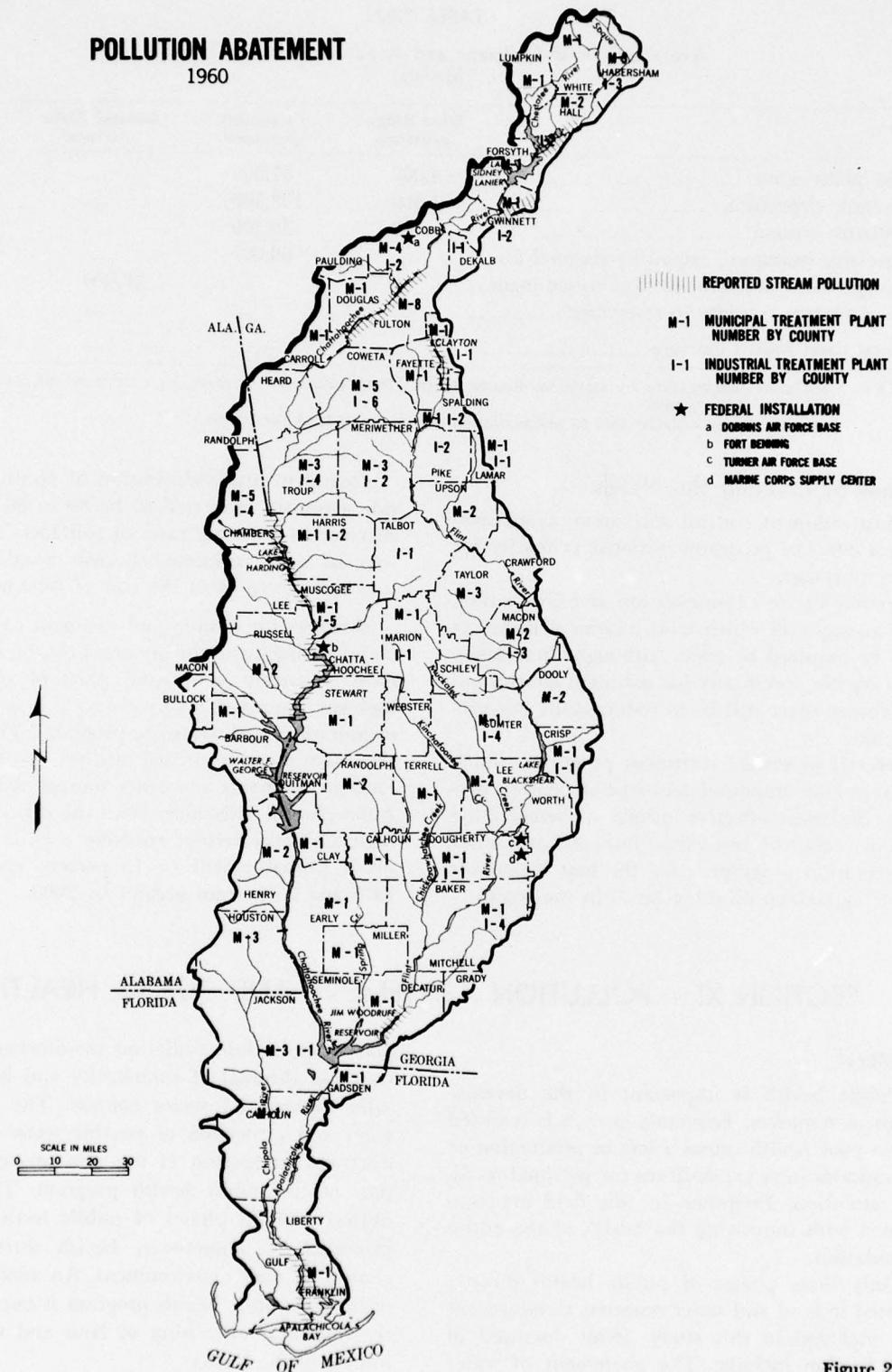


Figure 2.51

Existing Facilities and Programs

Pollution Abatement

There have been several field studies of the rivers of the Apalachicola-Chattahoochee-Flint basins. Public health studies made of the Chattahoochee River in 1949-50 showed the waters below Atlanta to be appreciably degraded in quality because of discharge of partially treated wastes from the Atlanta area. Subsequent development such as the closure of Buford Dam and the rapid municipal and industrial growth of the Atlanta metropolitan area have changed the conditions of the water quality in this reach of the stream. Further investigations will be needed to determine the extent of these changes. Studies in 1959 indicated that the major use of the Chattahoochee River from the Columbus-Phenix City area to the headwaters of Lake Seminole, impounded by Jim Woodruff Dam, was for the disposal of untreated municipal and industrial wastes. The major sources of these wastes were Columbus and the Fort Benning Military Reservation in Georgia and Phenix City and Eufaula in Alabama. Water in reaches of the Chattahoochee is unsafe for recreational uses. Completion of the Walter F. George and Columbia Locks and Dams in the lower Chattahoochee River will affect the assimilating capacity of the streams, and further investigations will be needed. Prior to the construction of Jim Woodruff Dam, the Florida State Board of Health found the Apalachicola River to be grossly polluted throughout its length. Although the major pollution sources have continued unabated, the installation of the reservoir which detains flows for long periods of time has greatly reduced the concentration of bacteria in the river below the dam. Studies made in 1958 and 1960 near Bainbridge, Georgia, indicated that a local pollution problem exists, because of the

discharge of untreated wastes by that municipality. Localized pollution problems have been observed to exist in several other areas within the basins. These problems are due, generally, to the discharge of untreated or partially treated municipal and industrial wastes. Past studies and reports have indicated areas where pollution problems have existed. More detailed and extensive field studies are needed to adequately determine the effects of the rapidly changing economy and development of the basins on the quality of the surface waters.

In 1960 sewerage systems of 63 municipalities served only a part of their population and 13 municipalities with populations of 800 or more had no sewage collection systems. Existing treatment facilities at 20 municipalities and semi-public institutions were considered adequate for the 1960 need. Little or no treatment was provided by 36 municipalities. The municipal and industrial waste discharges have not generally been measured. For the purposes of this Report, except where data are available, the waste discharges are considered equal to the volume of water used, as established by an inventory made in 1960.

The estimated 1960 population served by the 103 municipal sewerage systems totaled about 973,800 people. Based on the biochemical oxygen demand, industrial wastes discharged to the municipal systems increased the population equivalent of the untreated wastes to 1,474,000 people. Sixty-one industrial plants maintained separate waste systems in 1960. Only 8 of the industries surveyed in 1960 had adequate treatment facilities for handling their liquid wastes.

Observations of streams below waste discharge points and reports of stream conditions showed that wastes were handled unsatisfactorily in some areas.

TABLE 2.23
Municipal Pollution in 1960

Municipality	Municipal population	Population served	Treatment		Receiving stream and load to stream PE (1,000) ²
			Type ¹	Design capacity PE (1,000)	
Alabama Abbeville	2,524	2,500	none	..	2.5 Trib.-Abbie Cr.-Chattahoochee; PE 2.5

(continued)

TABLE 2.23—Continued

Municipality	Municipal population	Population served	Treatment			Receiving stream and load to stream PE (1,000) ²
			Type ¹	Design capacity PE (1,000)	Waste load PE (1,000)	
Ashford	1,511	800	2	1.5	0.8	Trib.-Cowarts Cr.-Apalachicola; PE 0.1
Columbia	783	600	none	--	0.6	Chattahoochee; PE 0.6
Dothan (part)	31,440	7,500	2	10.0	7.5	Trib.-Omussee Cr.-Chattahoochee; PE 0.8
Eufaula	8,357	4,500	none	--	4.5	Chattahoochee; PE 4.5
Fairfax (uninc.)	3,107	3,100	1	1.0	3.1	Osanippa Cr.-Chattahoochee; PE 2.5
Headland (part)	2,650	1,100	none	--	1.1	Mill Cr.-Omussee Cr.-Chattahoochee; PE 1.1
Hurtsboro	1,056	800	none	--	0.8	Trib.-N.F. Cowikee Cr.-Chattahoochee; PE 0.8
Lafayette (part)	2,605	1,500	none	--	1.5	Allen Cr.-Kellerm Hill Cr.-Chattahoochee; PE 1.5
Langdale-Shawmut	4,426	4,425	none	--	5.2	Chattahoochee; PE 5.2
Lanett	7,674	5,300	none	--	6.2	Chattahoochee; PE 6.2
Phenix City	27,630	15,000	none	--	19.0	Chattahoochee; PE 19.0
Riverview (uninc.)	1,171	1,170	none	--	1.4	Chattahoochee; PE 1.4
Roanoke (part)	5,288	300	none	--	0.3	Guss Cr.-Chattahoochee; PE 0.3
Florida						
Apalachicola	3,099	2,100	2	4.0	2.1	Scipio Cr.-Apalachicola; PE 0.4
Blountstown	2,375	1,400	0	0.5	1.4	Unnamed Cr.-Apalachicola; PE 1.4
Chattahoochee	9,699	2,713	1	4.0	2.7	Mosquito Cr.-Apalachicola; PE 1.1
State Hospital	7,300	7,300	2	5.0	13.0	Mosquito Cr.-Apalachicola; PE 6.0
Cottondale	849	550	0	3	0.6	Ditch Cr.-Chipola; PE 0.5
Marianna	7,152	7,700	1	10.0	7.7	Marshall Cr.-Chipola; PE 5.0
Fla. Boys School	950	950	2	0.8	1.0	Marshall Cr.-Chipola; PE 0.2
Sneads Project	108	108	2	0.1	0.1	Ditch-Hamm Pond-Apalachicola
St. Hosp. Farm	235	235	2	0.3	0.2	Ditch-Lake Seminole
Apalachee Inst.	600	600	1	0.6	0.6	Lake Seminole; PE 0.4
Georgia						
Albany	55,890	35,750	1	125.0	89.0	Flint; PE 57.8
Radium Springs	375	300	none	--	0.3	Flint; PE 0.3
Marine Center	2,593	2,593	2	3	2.6	Flint; PE 0.5
Americus #1	13,472	5,650	2	14.0	5.7	Muckalee Cr.-Flint; PE 2.0
#2	--	800	2	2.0	0.8	Willets Cr.-Muckalee Cr.-Flint; PE 0.2
Voc. School	450	450	2	0.7	0.4	Sweetwater Cr.-Flint; PE 0.3
Arlington	1,462	500	0	3	0.5	Spring Cr.-Lake Seminole; PE 0.4
Arnco Village	1,000	800	1	0.7	0.8	Wahoo Cr.-Chattahoochee; PE 0.6
Atlanta ⁴						
Camp Creek	--	12,000	1	25.0	12.0	Chattahoochee; PE 6.0
Clayton	--	352,000	1	420.0	640.0	Chattahoochee; PE 391.0
Flint River	--	18,920	2	20.0	21.8	Flint; PE 3.0
Sandy Creek	--	4,390	1	10.0	4.4	Chattahoochee; PE 1.5
Utoy Creek	--	34,300	1	90.0	40.1	Chattahoochee; PE 23.0
Austell	1,867	1,250	1	5.0	1.2	Sweetwater Cr.-Chattahoochee; PE 0.9
Bainbridge	10,210	5,000	none	--	5.0	Flint-Lake Seminole; PE 5.0
Barnesville (part)	--	700	2	1.3	0.7	Little Potato Cr.-Flint; PE 0.1
Blakely	3,580	4,000	2	10.0	4.0	Dry Cr.-Spring Cr.-Lake Seminole; PE 0.6
Buena Vista	1,574	1,000	1	2.5	1.4	Trib.-Oochee Cr.-Flint; PE 0.8
Buford	4,151	3,800	1	5.0	3.8	Suwance Cr.-Chattahoochee; PE 2.7
Buford Dam	30	140	0	3	0.1	Chattahoochee
Butler	1,346	1,100	1	3	1.1	Trib.-Patsiliga Cr.-Flint; PE 0.7
Byromville	349	100	none	--	0.1	Turkey Cr.-Flint; PE 0.1
Camilla	4,753	3,500	2	5.0	3.5	Trib.-Big Slough Cr.-Flint; PE 0.5
Clarksdale	440	440	1	1.3	0.6	Sweetwater Cr.-Chattahoochee; PE 0.4
Clarkesville	1,352	1,300	1	2.0	2.0	Soque-Chattahoochee; PE 1.3
Clayton Co. (part)	--	2,400	2	10.0	2.4	Flint; PE 2.2
College Park	475	475	2	0.8	0.5	Trib.-Flint; PE 0.1
Cleveland	657	400	1	0.7	0.4	Trib.-Tenessee Cr.-Chestatee; PE 0.2
Cobb Co. (part) ⁵	--	15,150	2	5.0	15.2	Nickajack Cr.-Chattahoochee; PE 6.0
College Park	23,469	5,500	2	12.0	5.5	Walters Cr.-Flint; PE 0.6
Colquitt	1,556	1,500	1	1.2	1.5	Spring Cr.-Flint; PE 1.0
Columbus	116,776	140,000	none	--	195.0	Chattahoochee; PE 195.0
Cordele	10,609	7,000	2	14.0	7.0	Gum Cr.-Flint; PE 4.0
Cornelia	2,936	2,400	2	2.5	2.5	N.F.-Little Mud Cr.-Chattahoochee; PE 1.0
Cumming	1,561	300	1	0.5	12.3	Trib.-Big Cr.-Chattahoochee; PE 12.3
Cuthbert	4,300	2,580	none	--	2.6	Trib.-Carter-Ichawaynochaway; PE 2.6
Dahlonega	2,604	1,500	1	3.2	1.5	Cane Cr.-Chestatee-Chattahoochee; PE 1.0
Dawson	5,062	2,920	none	--	2.9	Brantley-Chickasawhatchee Cr.-Flint; PE 2.9
Decatur Prison Br.	85	85	none	--	0.1	Ditch-Flint-Lake Seminole; PE 0.1
Demorest	1,029	1,000	1	1.3	1.0	Hazel Cr.-Soque-Chattahoochee; PE 0.7
Dobbins AFB	12,000	12,000	1	50.0	12.0	Nickajack Cr.-Chattahoochee; PE 6.0

(continued)

TABLE 2.23—Continued

Municipality	Municipal population	Population served	Treatment			Receiving stream and load to stream PE (1,000) ²
			Type ¹	Design capacity PE (1,000)	Waste load PE (1,000)	
Donalsonville	2,621	1,800	1	3.0	1.8	Drain-Spring Cr.-Lake Seminole; PE 1.2
Douglasville	4,423	2,950	1	2.4	3.0	Gothards Cr.-Sweetwater Cr.-Chattahoochee; PE 2.4
East Newnan (uninc.)	1,874	650	none	--	0.6	Trib.-Whiteoak Cr.-Flint; PE 0.6
East Thomaston	2,237	2,240	none	--	2.5	Trib.-Swift Cr.-Flint; PE 2.5
Edison	1,232	800	1	2.0	0.8	Trib.-Ichawaynochaway Cr.-Flint; PE 0.5
Fairburn #1	2,470	930	2	0.6	0.9	Deep Cr.-Chattahoochee; PE 0.5
#2		930	2	0.4	0.9	Trib.-Flint; PE 0.5
Fayetteville	1,389	300	none	--	0.3	Trib.-Flint; PE 0.3
Fort Benning #1	80,000	55,580	none	--	55.6	Chattahoochee; PE 55.6
#2		16,800	2	3	16.8	Upatoi Cr.-Chattahoochee; PE 4.4
Fort Gaines	1,320	1,000	none	--	1.0	Chattahoochee; PE 1.0
Gainesville #1	16,523	5,000	2	30.0	14.0	Lake Lanier; PE 2.0
#2		4,000	2	15.0	54.0	Flat Cr.-Lake Lanier; PE 12.0
Grantville #1	1,158	750	0	3	0.8	Trib.-New-Chattahoochee; PE 0.6
#2		450	0	3	0.4	Trib.-Yellowjacket Cr.-Chattahoochee; PE 0.4
Greenville	726	600	none	--	0.6	Trib.-Redoak Cr.-Flint; PE 0.6
Griffin (part)	10,868	8,000	2	13.0	8.0	Trib.-Flint; PE 1.2
Hampton	1,253	1,500	2	2.0	1.5	Bear Cr.-Flint; PE 0.4
Hogansville	3,658	3,500	0	3	3.5	Yellowjacket Cr.-Chattahoochee; PE 3.4
Jonesboro	3,014	1,200	1	3	1.2	Trib.-Half Mile Cr.-Flint; PE 1.0
LaGrange #1	23,632	1,000	2	2.5	1.0	Trib.-Yellowjacket Cr.-Chattahoochee; PE 0.1
#2		15,000	2	35.0	20.0	Blue John Cr.-Chattahoochee; PE 5.4
#3		7,500	none	--	7.5	Yellowjacket Cr.-Chattahoochee; PE 7.5
Leesburg	774	300	0	3	0.3	Trib.-Kinchafoonee Cr.-Flint; PE 0.3
Lee Prison Br.	158	158	0	3	0.2	Trib.-Kinchafoonee Cr.-Flint; PE 0.1
Lumpkin	1,348	830	1	0.8	0.8	Hodchodgee Cr.-Pataula Cr.-Chattahoochee; PE 0.5
Manchester	4,115	4,110	2	5.0	5.0	Pigeon Cr.-Flint; PE 0.8
Marietta	25,565	31,600	2	25.0	23.0	Soap Cr.-Chattahoochee; PE 4.7
Eastside			2	20.0	4.4	Rotten Wood Cr.-Chattahoochee; PE 0.4
Southeast			2	10.0	3.4	Olley Cr.-Sweetwater Cr.-Chattahoochee; PE 0.7
Southside			2	10.0	3.6	Trib.-Noses Cr.-Chattahoochee; PE 0.4
Westside			2	4.0	1.9	Trib.-Mill Cr.-Flint; PE 0.1
Meriwether County			0	3	0.1	Beaver Cr.-Flint; PE 1.9
Prison Br.	85	85	0	--	1.9	Limestone Cr.-Lake Lanier; PE 0.2
Montezuma	3,744	1,900	none	--	1.9	Trib.-Wahoo Cr.-Chattahoochee; PE 3.0
New Holland (uninc.)	1,570	1,570	2	4.0	1.9	Mineral Springs Cr.-Mountain Cr.-Chattahoochee; PE 0.8
Newnan #1	12,169	3,000	none	--	3.0	Cotton Mill Cr.-Whiteoak Cr.-Flint; PE 0.6
#2		4,000	2	4.5	4.0	Trib.-Crooked Cr.-Chattahoochee; PE 0.1
#3		3,000	2	3.2	3.0	Trib.-Peachtree Cr.-Chattahoochee
Norcross			0	3	0.4	Mill Cr.-Flint; PE 0.4
Winter Hill	350	350	2	0.3	0.4	Bear Cr.-Chattahoochee; PE 0.6
Camp Ground	40	40	0	3	--	Trib.-Potato Cr.-Flint; PE 7.0
Oglethorpe	1,169	350	none	--	0.4	Bohannon Cr.-Nickajack Cr.; PE 1.0
Palmetto	1,446	950	1	1.5	1.0	Muckaloochee Cr.-Flint; PE 0.2
Pine Mountain	790	450	1	0.7	0.4	Wahoo Cr.-Chattahoochee; PE 0.5
Potterville (uninc.)	150	150	none	--	0.2	Ichawaynochaway Cr.-Flint; PE 0.6
Reynolds	1,087	650	none	--	0.6	Big Cr.-Chattahoochee
Richland	1,472	1,100	0	3	1.1	Wahoo Cr.-Chattahoochee; PE 0.9
Roswell Housing		200	2	3.3	0.2	Bohannon Cr.-Nickajack Cr.; PE 1.0
Sargent (uninc.)	1,500	800	1	1.2	0.8	Muckaloochee Cr.-Flint; PE 0.2
Shellman	1,050	600	none	--	0.6	Trib.-Potato Cr.-Flint; PE 7.0
Smithville	723	200	none	--	0.2	Flint; PE 0.8
Smyrna (part)	10,157	5,000	2	4.0	5.0	Pennahatchee Cr.-Flint; PE 1.0
Thomaston	9,336	10,500	2	10.0	12.5	Sweetwater Cr.-Chattahoochee; PE 0.6
Turner AFB	5,000	5,000	2	6.0	5.0	Trib.-Cane Cr.-Flint; PE 0.1
Vienna	2,099	1,000	none	--	1.0	Chattahoochee; PE 3.9
Villa Rica (part)	3,450	1,000	2	0.6	1.0	
Warm Springs	350	325	2	0.8	0.3	
West Point	4,610	3,900	none	--	3.9	

NOTES: ¹ Treatment: None = no treatment; 1 = primary; 2 = secondary; 0 = septic tank.² Population equivalent based on biochemical oxygen demand.³ Undetermined.⁴ Serves Doraville, Chamblee, North Atlanta, and portions of Clarkston, Decatur, East Point, Hapeville, and College Park.⁵ Serves a portion of Smyrna.

TABLE 2.24
Industrial Wastes and Treatment in 1960

Industry			Waste*		Type of treatment	PE (1,000)* after treatment	Receiving stream
Type	Number of plants	Number of employees	Average flow (m.g.d.)	PE (1,000) before treatment			
Chemical	8	396	0.865	--	None	--	Swamp
			0.024	--	None	--	Ditch-Gum Cr.-Flint
			1.350	--	None	--	Flint
			0.002	--	Inj. well	--	Ditch to dry well
			0.124	--	None	--	Trib.-Big Slough Cr.-Flint
			0.072	--	None	--	Ditch-Bull Cr.-Chattahoochee
			0.060	--	None	--	Ditch-Muckalee Cr.-Flint
Food	18	1,300	0.001	--	None	--	Trib.-Muckalee Cr.-Flint
			0.003	--	None	--	Chipola
			0.500	4.0	None	4.0	Ditch-Whiteoak Cr.-Flint
			0.002	--	None	--	Flint
			0.035	--	None	--	Ditch-lime sink
			0.075	3.3	Stab. pond	1.0	Ivy Cr.-Suwanee Cr.-Chattahoochee
				10.0	None	10.0	Trib.-Mud Cr.-Chattahoochee
			0.102	4.3	Screens	4.3	Palmetto Cr.-Mulberry Cr.
			0.005	0.2	None	0.2	Trib.-Big Potato Cr.
			0.400	20.0	Vib. screens	20.0	Beaver Cr.-Flint
			0.125	3.8	Screens	3.8	Oochee Cr.-Chattahoochee
			0.240	12.0	Screens	12.0	Trib.-Cane Cr.-Flint
			0.012	0.4	Catch basin	0.4	Big Slough Cr.-Flint
			0.140	4.8	Screens	4.8	Trib.-Big Slough Cr.-Flint
Leather Metal	1	225	0.020	5.0	Settling	5.0	Elkins Cr.-Flint
			0.050	2.2	Screens	2.2	Elkins Cr.-Flint
			0.320	1.6	Screens	1.6	Potato Cr.-Flint
			0.018	1.1	Screens	--	Ditch-Town Cr.-Flint
			0.315	10.0	Screens	10.0	Sweetwater Cr.-Flint
			0.430	29.2	Vib. screens	29.2	Suwanee Cr.-Chattahoochee
			0.168	--	Chem. prec.	--	Flint
			0.070	--	None	--	Trib.-Mountain Cr.-Chattahoochee
Miscellaneous	1	20	undetermined	--	None	--	Nancy Cr.-Chattahoochee
			0.025	--	None	--	Trib.-Upatoi Cr.-Chattahoochee
Paper	2	180	0.285	2.3	Lagoons	0.5	Sweetwater Cr.-Chattahoochee
			0.001	--	Broad irr.	--	Ground
Rubber Textile	1	50	0.004	--	Chem. prec.	--	Sweetwater Cr.-Chattahoochee
			1.200	25.0	None	25.0	Ditch-Osanippa Cr.-Chattahoochee
			4.000	50.0	None	50.0	Chattahoochee
			0.070	0.3	Septic tank	0.2	Osanippa Cr.-Chattahoochee
			0.026	0.3	Septic tank	0.3	Osanippa Cr.-Chattahoochee
			0.213	3.5	None	3.5	Messiers Cr.
			0.040	5.0	None	5.0	Trib.-Wahoo Cr.-Chattahoochee
			0.120	5.0	None	5.0	Trib.-Wahoo Cr.-Chattahoochee
			0.200	4.0	None	4.0	Trib.-Wahoo Cr.-Chattahoochee
			0.005	--	None	--	Soque-Chattahoochee
Textile	27	22,548	0.004	0.1	None	0.1	Trib.-Mud Cr.-Chattahoochee
			0.240	2.7	Secondary	0.3	Balus Cr.-Lake Lanier
			0.100	0.5	Secondary	--	Limestone Cr.-Lake Lanier
			0.015	--	None	--	Ditch-Flint
			0.015	--	None	--	Flint
			0.070	3.6	None	3.6	Pigeon Cr.-Flint
			1.310	19.0	None	19.0	Chattahoochee
			1.000	21.0	None	21.0	Chattahoochee
			0.017	0.3	None	0.3	Chattahoochee
			0.005	1.5	None	1.5	Cr.-Chattahoochee
			0.001	--	None	--	Trib.-Flint
			0.030	4.8	None	4.8	Swamp
			0.403	7.0	None	7.0	Lone Cane Cr.-Chattahoochee
			0.093	8.0	None	8.0	Shoal Cr.-Chattahoochee
			0.150	36.0	None	36.0	Yellowjacket Cr.-Chattahoochee
			0.763	10.0	None	10.0	Blue John Cr.-Lone Cane Cr.
			2.500	20.0	None	20.0	Trib.-Swift Cr.-Flint
			0.010	--	None	--	Potato Cr.-Flint

* m.g.d. = million gallons per day; PE = population equivalent.

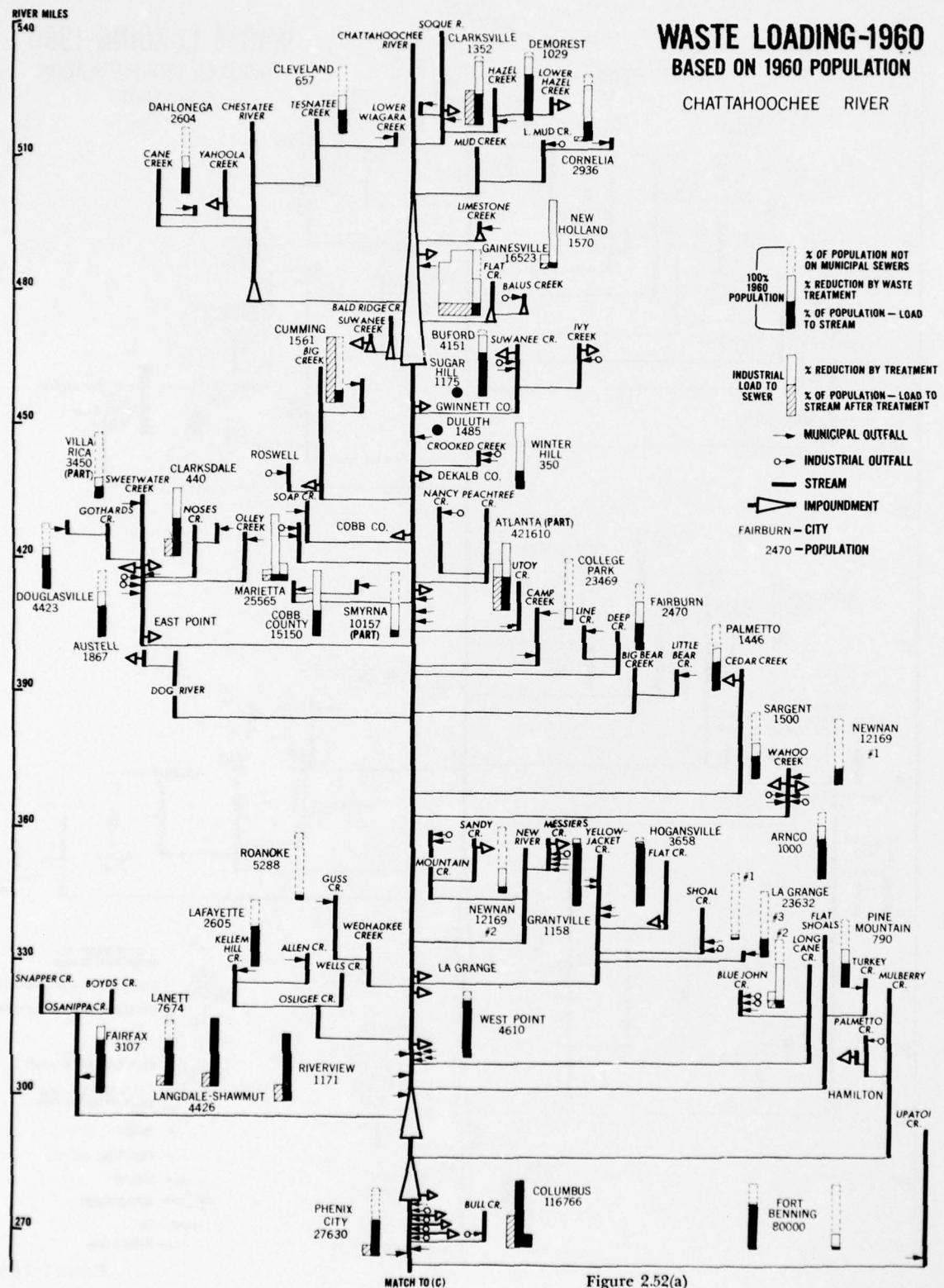


Figure 2.52(a)

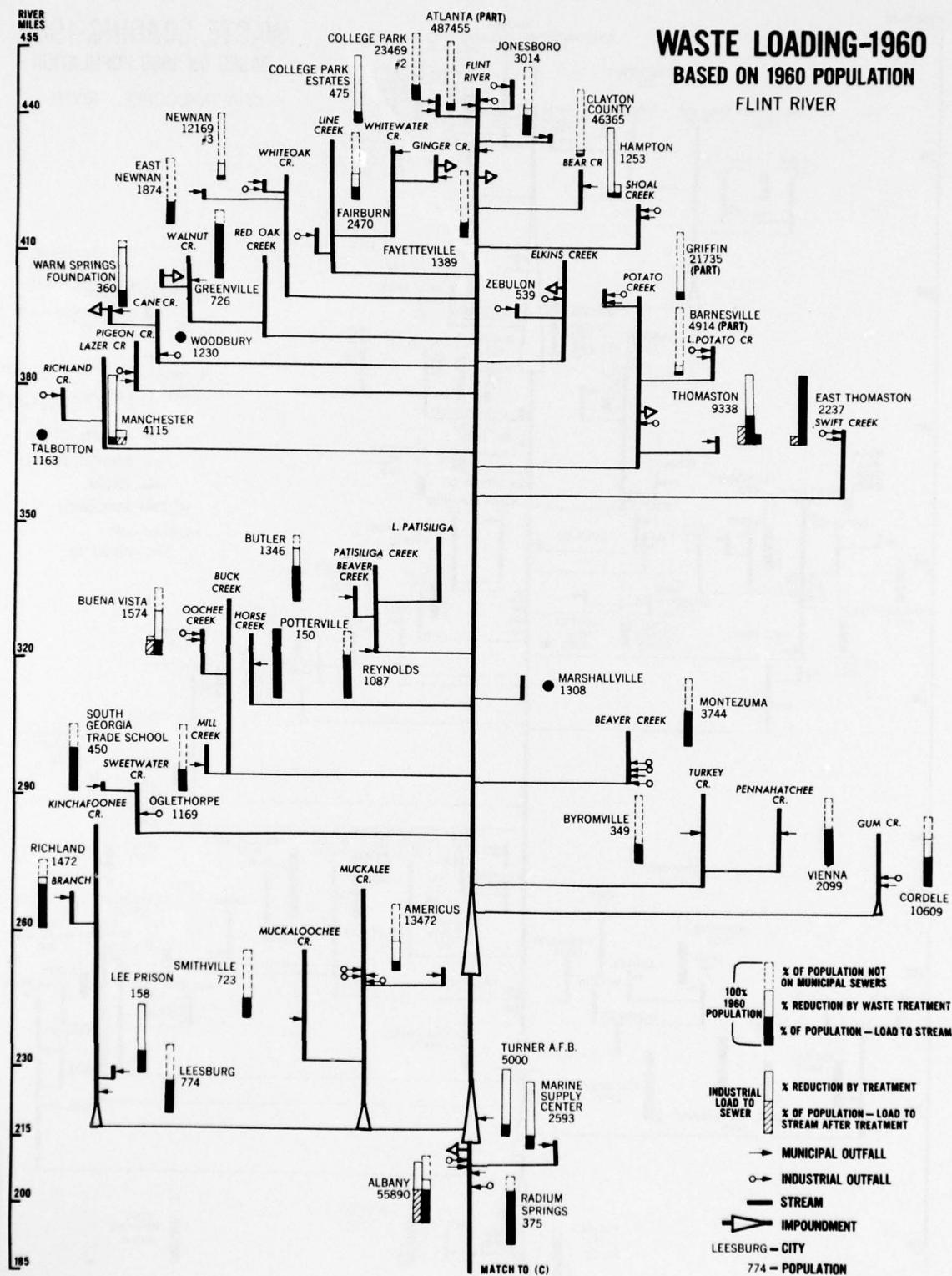


Figure 2.52 (b)

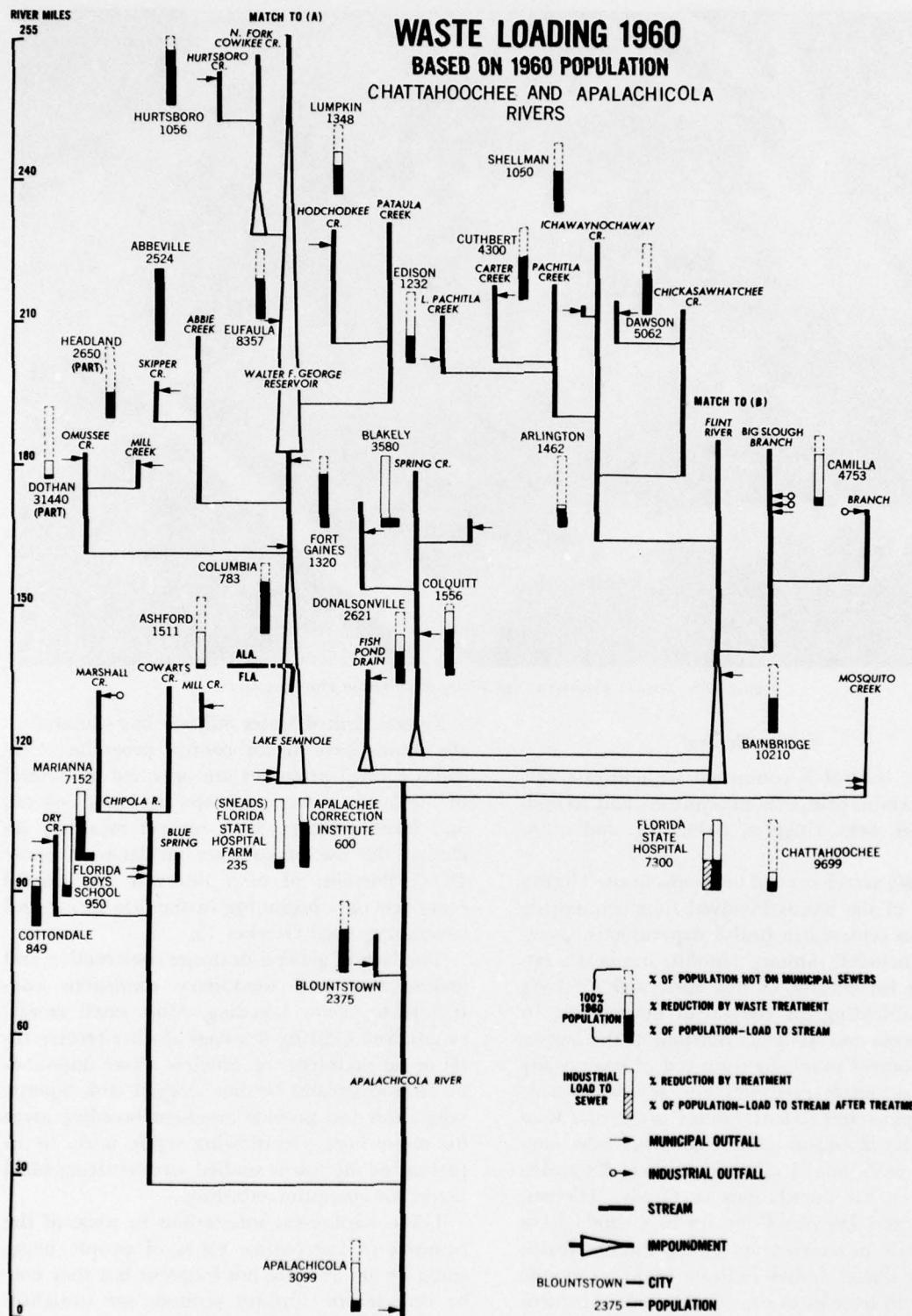


Figure 2.52(c)

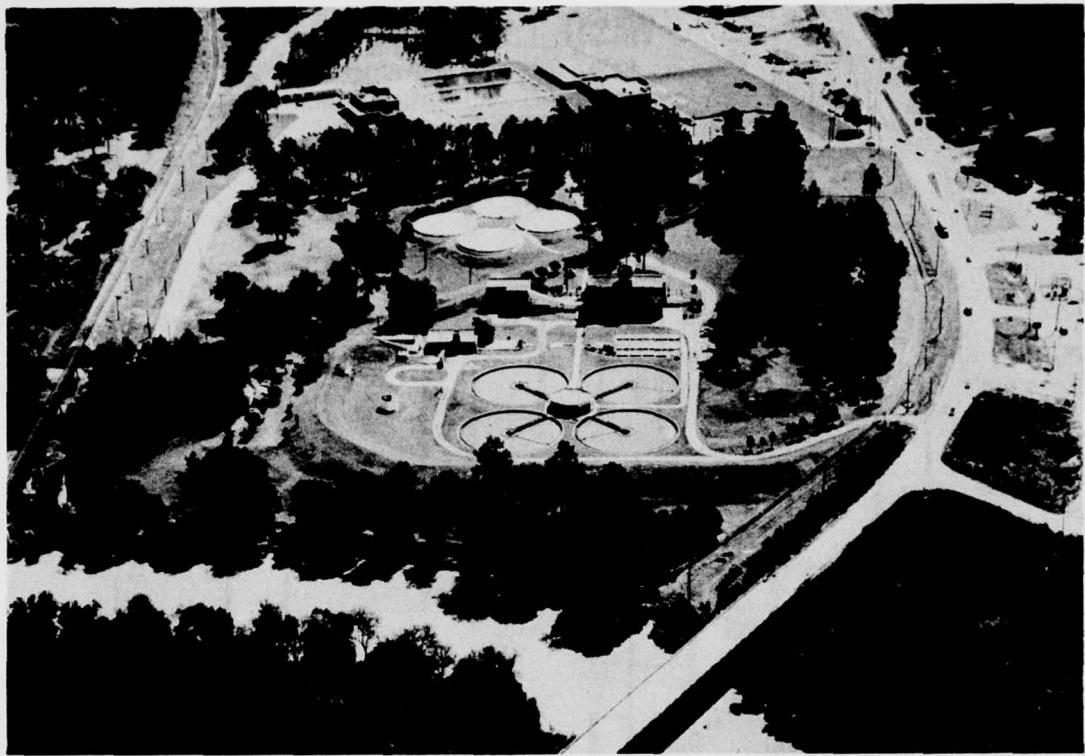


Figure 2.53 *Sewage Treatment and Water Purification Plants, Atlanta.*

Vector Control

Vector control is concerned with disease carrying vermin, primarily mosquitoes, and secondarily flies, fleas, chiggers, ticks, rats, and other pests.

In 1960, vector control programs in the Florida portion of the basins involved four countywide programs centered in health departments. Operations included sanitary landfill, bay-beach larviciding for control of dog flies, and ditching and adulticiding for control of mosquitoes. In the Georgia and Alabama portions of the basins, vector control programs consisted of several city mosquito-control programs and several countywide typhus and rodent control programs. Most of the city mosquito control activities were concerned with adulticiding measures. Extensive studies on rat populations in Grady, Thomas, Brooks, and Decatur Counties in Georgia have been made in recent years by the Public Health Service. These studies indicate many economic and health benefits of countywide rodent control programs.

Several United States military bases located in the basins have vector control programs. Mosquito control programs are operated on several of the larger power reservoirs by State, Federal, and local agencies. Such control measures included the use of contract airplanes to spray DDT. Portions of each reservoir are treated every few days beginning in the late spring and continuing until October 15.

The lack of general drainage construction and maintenance and unsanitary conditions contribute to vector breeding. Most small creeks, canals, and existing drainage ditches receive little or no maintenance. Shallow water impoundments and streams become clogged with aquatic vegetation and provide excellent breeding areas for mosquitoes. Overflowing septic tanks in 15 percent of the towns studied were creating ideal places for mosquito breeding.

There are fire-ant infestations in some of the counties in the basins. Cases of people being stung by fire ants are not frequent but they may be very severe. Fire-ant mounds are unsightly and harmful to agricultural operations. The

chemical control programs used to combat the fire ant are harmful to wildlife and may contaminate water supplies.

Air Pollution Monitoring

The Alabama, Georgia, and Florida Departments of Public Health cooperate with the Public Health Service in the national air sampling network program. Urban network sampling stations in or near the area are in Atlanta, Macon, Columbus, Birmingham, and Mobile. The Florida State Board of Health and the Industrial Hygiene Section of the Georgia Department of Public Health, in cooperation with the Public Health Service, made statewide surveys to locate all sources of air pollution in the two States. These surveys were completed in 1961. Existing air pollution programs in each of the three States are vested in the State health agencies.

Radiation Monitoring

Limited radiological health programs in the basins are conducted by the Florida and Alabama health departments and the national water network stations of the Public Health Service. The Georgia Department of Public Health plans a surface water monitoring program to gather data on radioactivity in the streams in the State. The air phase of surveillance was never undertaken by the States because personnel and equipment were lacking. The development of this phase of the program is increasingly important.

There are two nuclear reactors in the basins and 44 licensed isotope users in the Albany, metropolitan Atlanta, and West Point, Georgia, areas. The Florida Board of Health collected water samples over the State for radiological analysis during 1958 and 1960. Water samples are collected from surface and ground water sources at permanent sampling stations in each of the watersheds of the State.

Solid Waste Disposal

Most of the communities in the basins collect and dispose of solid waste as a governmental service. In a few instances, however, the collection and disposal is left to the individuals producing the waste or to private collectors who charge a fee for the service. States and local health departments have adequate authority to control the storage, collection, and disposal of



Figure 1. An unsatisfactory Method of Solid-Waste Disposal Creates a Health Hazard and Public Nuisance.

solid waste.

Albany, College Park, East Point, Hapeville, Griffin, Marietta, Smyrna, and Muscogee County in Georgia all have sanitary landfills serving an estimated 300,000 persons. Modified sanitary landfills serve 35,000 persons in Phenix City, Alabama; Apalachicola and Wewahitchka, Florida; and Cornelia, Georgia. The city of Atlanta collects and disposes of all the solid refuse for Fulton County, with the exception of some rural areas and except for the College Park-East Point-Hapeville area, which has a separate program. Atlanta operates a 700-ton incinerator and 4 modified landfills to dispose of the wastes from an estimated 515,000 persons. In 1960 an estimated 105 communities having populations of 500 or more are assumed or known to have had inadequate programs for solid-waste disposal. The combined population of these communities is estimated to be 382,000 people.

Needs and Opportunities

Pollution Abatement

The ever-increasing populations and the expanding industrial complexes will create more problems of pollution abatement and public health than now exist. These problems can be solved by a policy of practical treatment of effluents to protect public health and preserve or enhance the esthetic values of an area. This goal is included in the plan of development, and its

TABLE 2.25
Municipal Sewerage System Needs

Population range	Total number of places	Number of places requiring additional or new construction					
		Primary	Secondary	Stabilization pond	Collection system		
1960 to 1975							
Under 2,500	56	10	10	26	47		
2,500 to 10,000	22	7	10	1	21		
Over 10,000	21	1	20	---	21		
1975 to 2000							
Under 2,500	42	1	1	2	29		
2,500 to 10,000	26	4	8	---	21		
Over 10,000	34	1	32	---	34		
Summary							
State	Year	Total number of places	Number receiving treatment		Stabilization ponds	Collection systems	Population served (1,000)
			Primary	Secondary			
Alabama	1975	14	3	4	7	13	174
	2000	14	1	5	---	12	245
Florida	1975	8	4	3	---	8	39
	2000	8	---	2	---	7	58
Georgia	1975	77	11	33	20	68	1,755
	2000	80	5	34	2	65	3,415
Total	1975	99	18	40	27	89	1,968
	2000	102	6	41	2	84	3,718

attainment is essential to the immediate and future prosperity of the entire basins.

A policy of pollution prevention as well as pollution abatement would be very helpful. Organic wastes not amenable to conventional treatment and all inorganic wastes should be reduced to satisfactory limits before being discharged to the streams. Adequate treatment should be provided for all industrial and municipal wastes prior to their discharge to the water courses of the basins. Special handling may be required for some industrial wastes. The type of treatment required will depend upon the waste to be treated and the assimilative capacity of the receiving stream. A separate determination is needed in each case.

Primary treatment of municipal sewage and equivalent treatment of industrial waste, effecting the substantial removal of settleable solids, are the minimum acceptable treatment necessary to assure continued growth and expansion within the basins.

Where critical streamflows are too small to provide proper dilution of effluent from secondary treatment plants, either additional dilution water or a higher degree of treatment will be needed to adjust the waste loading to the minimum streamflow condition.

In estimating sewerage needs, all towns with population over 800 have been included. Also included are smaller towns which had sewerage systems in 1960.

There is need for additional comprehensive water quality study of the Apalachicola-Chattahoochee-Flint basins. Such a study should include basic data on waste loadings and water quality characteristics to determine the existing quality of the waters. It should include the effects of pollution resulting from the use of agricultural chemicals and the pollutional effects of any other activities which might affect the water quality. There is a need for research to develop more effective treatment methods for the handling of all wastes.

Vector Control

Florida has statewide enabling legislation for establishing mosquito and vector control districts. Similar legislation would be helpful, if enacted in Georgia and Alabama. Local governmental units of these two States do have authority by State law to conduct mosquito control work. A statewide enabling act would permit better coordination of the programs.

There is a need for more emphasis on both mosquito larvicing and permanent control measures. Each county needs at least one drag-line for mosquito control work. Each city in the district should have one or more year-round mosquito control workers who inspect for larva during the mosquito season, apply larvicides to mosquito breeding areas, operate adulticiding machines when large mosquito infestations occur, and maintain minor ditch construction during the winter months.

Regulations should be set up requiring control of wasteful artesian well flows. These abandoned wells create mosquito breeding areas. There is a need to develop a better salt marsh area control technique for permanent control of mosquitoes, sand flies, and other vectors. Methods of constructing and maintaining water management ditches should be improved. There is a need for improving present methods of handling manure and other wastes on livestock and poultry farms. Insanitary handling of such materials provides breeding places for flies, rats, and other vermin.

Air Pollution Monitoring

The measurement and identification of sources of air pollution by statewide surveys are urged. Such surveys would form a sound basis for industrial zoning which could be used in the planning and development of air pollution abatement programs for the basins. Most of the available data for the basins are reports of industrial air pollution. There is a need to determine the extent of air pollution from other sources. The burning of garbage and refuse on open dumps is a major source of air pollution which should be corrected. This was a common practice in most of the smaller communities in 1960.

Radiation Monitoring

The State public health agencies need funds and personnel to expand their water and air monitoring and milk and food surveillance programs. There is a need for a program to assure adequate monitoring of the health hazards involved in the use and disposal of radioactive isotopes.

Solid Waste Disposal

There is a need to extend the sanitary landfill waste disposal methods to all communities of over 500 population. When this is done, the fly and rodent problems will be greatly reduced or eliminated. The larger metropolitan areas may have to construct incinerators to reduce the volumes of their solid wastes where land areas for sanitary landfills are not conveniently available at reasonable costs.

The Atlanta incinerator needs to be enlarged prior to 1975. Incinerators will probably be needed for the Albany, Columbus-Muscogee County, Atlanta-Fulton County, and College Park-East Point-Hapeville areas. The combined 1975 population of these four metropolitan areas is estimated as 1,258,000 people. Before the year 2000 the city of Marietta will probably have grown to a size that can support an incinerator program. Phenix City, Alabama, is also projected to grow to such size and should consider an incinerator or cooperate in the Columbus-Mus-



Figure 2.55 Good Sanitary Landfill Practice Protects the Public and Enhances Land Values.

cogee County program. By the year 2000 the solid waste from an estimated population of 2,349,000 persons will be handled by incineration.

Open dumps or burning were a common method for disposing of solid wastes in 1960. Such practices are not acceptable, because of the health problems and nuisances created. Garbage and refuse in open dumps provide both food and refuge for insects and rodents. Smoldering piles of waste materials produce an odorous smoke which creates a nuisance over wide areas. Proper disposal of these materials is needed. Sanitary landfills cost little more than the operation of open dumps. Such disposal methods eliminate nuisances and prevent the development of health problems.

State and local health departments have adequate authority to control the storage, collection, and disposal of refuse. However, it is usually considered and handled as a municipal problem with consultation from State and local health departments.

Means of Meeting the Needs

Pollution Abatement

Prior to 1975, an estimated 1,968,000 people will live in areas served by municipal sewerage systems. Between 1975 and the year 2000, the number needing municipal sewerage systems will increase to 3,718,000 persons. Improvements

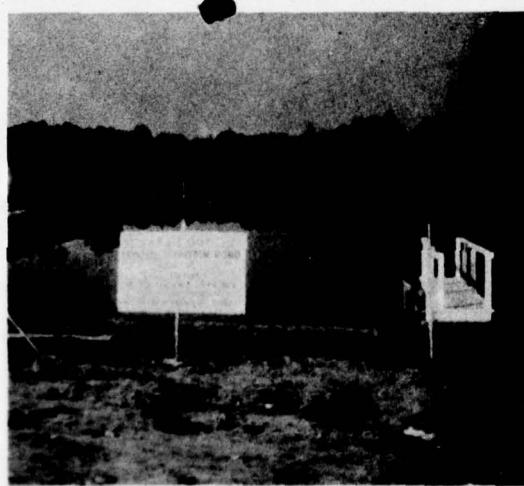


Figure 2.56 *Sewage Oxidation Pond Provides Economical Waste Treatment.*

needed for handling these wastes include primary treatment plants, secondary treatment plants, stabilization ponds, and extended sewerage systems.

Prior to 1975, 53 existing industries should provide satisfactory methods of waste treatment. The wastes from 14 of these industries could be treated economically by connecting to municipal sewerage systems. The municipal treatment plant should be designed to handle the additional waste load, and the industry should pay an equitable share of the cost of treatment. Treatment facilities should be provided by all new industries. Treatment plants should be designed specifically for the waste to be handled and should provide adequate treatment for the protection of the water quality in the receiving streams.

With the expected industrial development of the area, all industrial waste treatment plants will need to be enlarged prior to the year 2000.

In estimating municipal and industrial waste treatment facilities, the development of the area was taken into consideration. As development occurs, field studies will be needed to determine the degree and type of treatment required to prevent pollution of the receiving streams. Whenever it is economical to treat industrial waste with the domestic sewage, the industry can be expected to pay an appropriate share of the treatment costs.

The five-county metropolitan area of Atlanta and other large urban-industrial complexes need to develop coordinated plans for proper handling of all wastes. Such plans should assure a water quality in the receiving stream adequate to meet the needs for full development of the basins resources.

Low-flow augmentation will be required in some instances to maintain water quality in streams at desired levels. Low-flow augmentation, however, should be considered only after secondary treatment of all wastes has been provided.

Because of the volumes of waste discharged, it is not feasible in some areas to provide sufficient water for assimilating the treated wastes. In such areas, other methods or means must be developed for handling the waste discharges. Such situations need to be studied individually, so that plans can be made for additional treatment or for collecting and diverting the wastes

to other streams or watercourses where effluent following treatment can be satisfactorily handled without damage to the water resources.

Vector Control

Establishing vector control districts in Gulf and Franklin Counties, Florida, to provide a system of contiguous mosquito control districts is needed for efficient and economical control of salt-water mosquitoes, salt-marsh mosquitoes, dog flies, houseflies, and other vectors in coastal areas. Many lowland areas in the basins could be used for sanitary landfills to reduce vector breeding areas. State aid to organized mosquito control agencies in Florida has proven successful. Sanitary landfills are under the State-aid program because of their beneficial effect in mosquito control. Enabling legislation in Alabama and Georgia would permit similar State funds and technical assistance to be provided in this portion of the basins.

In order for the vector control programs to be compatible with multiple-purpose functions, it is essential that the programs be coordinated between all interests concerned, such as agriculture, wildlife conservation, and health.

Air Pollution Monitoring

Additional State legislation is needed to permit expansion of existing State programs. Effective municipal and industrial air pollution control programs will require full cooperation of the cities and industries and leadership by the designated State agencies. The recently completed surveys in Florida and Georgia should serve as a basis for the development of such legislation.

Radiation Monitoring

The control of the use of radioactive isotopes is a State responsibility. Appropriate funds, personnel, and legislative authority are needed to permit the States to have a balanced and effective program. Continuous monitoring is needed to detect any increase in radiation which could directly affect development of the land and water resources. Existing State programs should be continued and expanded.

Solid Waste Disposal

The sanitary landfill method is the most economical and desirable method to dispose of solid wastes for these smaller communities. Low marsh areas can be utilized for landfill operations. Landfill disposal properly controlled will prevent the breeding of flies, roaches, and rodents and will eliminate the nuisances of burning open dumps. The amount of solid waste produced nationally averages about 1 cubic yard, or 650 pounds per person per year. Disposal of waste by sanitary landfill requires 1 acre per 10,000 persons per year. The total per capita cost of collecting solid wastes, land, and acquiring needed operating sanitary landfill varies inversely with the size of the city. The total cost ranges from \$4.50 to \$1.50 per year. Disposal by landfill also affords an opportunity to reclaim low, marshy swamplands for other uses.

Cities with populations of more than 50,000 persons and with limited land areas for disposal of solid waste may require incinerators. The construction cost of large incinerators ranges from \$2,000 to \$4,000 for each ton of daily capacity. It is estimated that 1,000 persons in a large metropolitan area will contribute a ton of refuse per day. Operational cost totals approximately \$1.50 per ton, and collection cost totals approximately \$1.50 per person per year. The ashes and noncombustible material remaining after incineration will require approximately 1 acre per 30,000 persons per year for proper disposal.

Sanitary landfills serving an estimated 724,000 people in 114 communities should be operating prior to 1975. This figure includes some rural nonfarm populations living in unincorporated urban-type developments. The size of sanitary landfills will need to be increased prior to the year 2000 to serve an estimated 1,387,000 persons. Six of the metropolitan areas included will have grown to cities of over 50,000 by the year 2000. However, since these communities are isolated from other densely populated areas and land is available, they will probably continue to use sanitary landfills for the disposal of solid waste. Four metropolitan areas—Albany; Columbus, including Muscogee County; Atlanta, including Fulton County; and the College Park-East Point-Hapeville area—with a total combined population in 1975 estimated to be 1,258,000

persons, could advantageously use incinerators for the disposal of their solid wastes. Prior to the year 2000, the cities of Marietta, Georgia,

including its metropolitan area, and Phenix City, Alabama, might also profit by the use of incinerators for the disposal of their solid waste.

SECTION XII – OTHER BENEFICIAL PURPOSES BEACH EROSION CONTROL AND HURRICANE PROTECTION

General

The beaches are among the coastal areas most valuable resources. Florida's economy depends, to a large degree, upon vacationers. Many people are attracted by the superb beaches. The influx of new industries, residents, and tourists to coastal areas is increasing at a rapid rate. Over 3 million people have already settled along Florida's coasts. In addition to the population increases of established coastal cities, more than 100 new communities have grown up along the Florida coast. Some of these are in the Apalachicola basin.

The shoreline of the basins is about 60 miles

long. St. George and St. Vincent Islands, and Indian Peninsula and St. Joseph Spit, partially enclose the waters of Apalachicola Bay, St. Vincent Sound, and St. Joseph Bay. These islands and peninsulas are low and, near the shore, have firm land elevations 10 to 15 feet above mean sea level. Back from the shore, the elevations are slightly higher. Beach ridges, some over 35 feet high, occur on the islands and spits and on parts of the mainland coast. Shrubbery and trees cover most of the firm land.

St. George Island is a 30-mile long by one-half-mile wide barrier island. A large dune field, 20 to 30 feet high, behind the beach runs the length of the island to Cape St. George. The



Figure 2.57 Sand Has Moved Laterally into These Accretions on St. Vincent Island, Florida.

HURRICANE PATHS BEACH EROSION AND ACCRETION

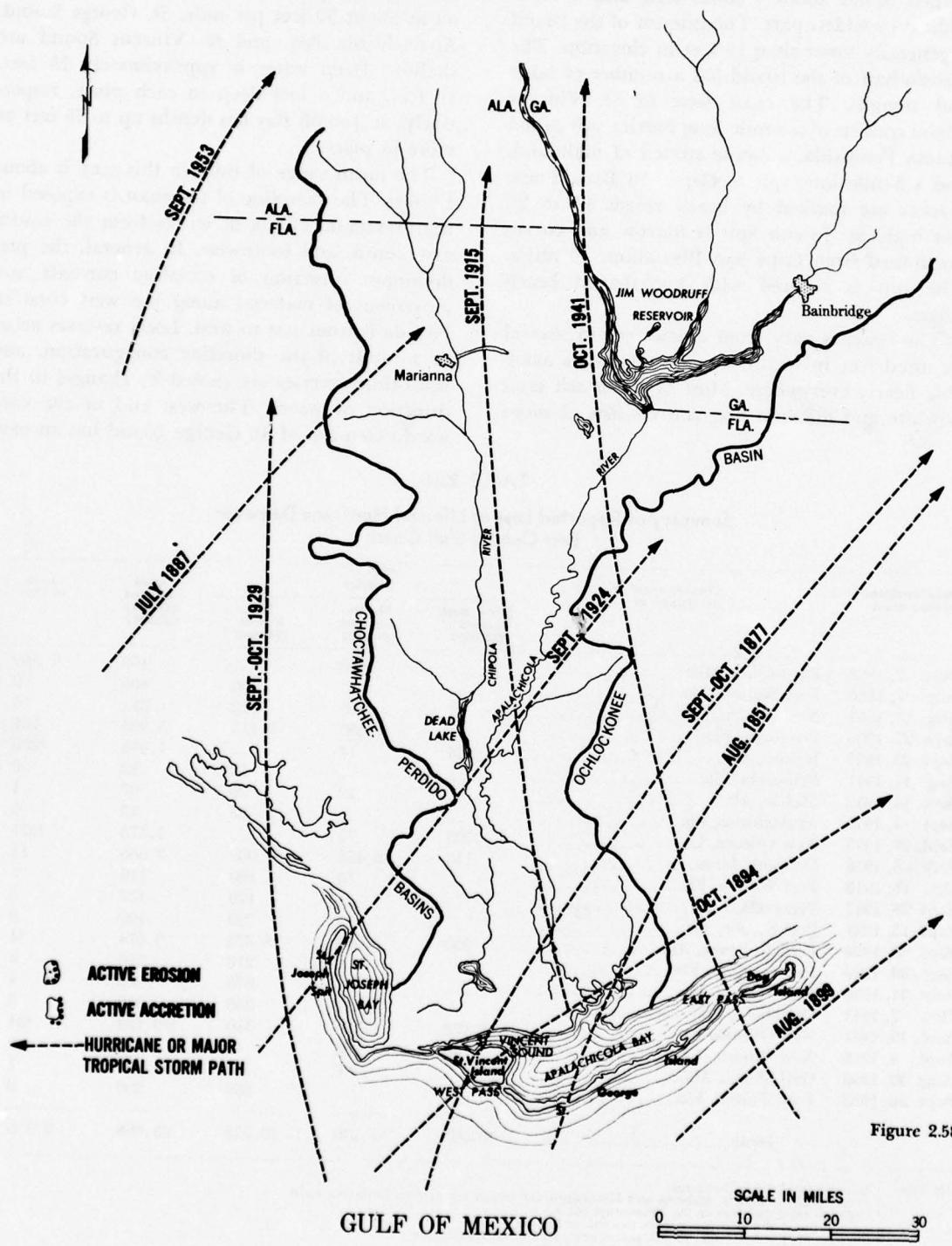


Figure 2.58

island is being developed as a residential and resort community. St. Vincent is a triangular-shaped island about 7 miles long and 4 miles wide at its widest part. The interior of the island is generally lower than 15 feet in elevation. The eastern half of the island has a number of lakes and sloughs. The coast west of St. Vincent Island consists of a 3-mile long barrier spit called Indian Peninsula, a 3-mile stretch of mainland, and a 3-mile long spit to Cape San Blas. These reaches are marked by beach ridges 10 to 20 feet high. St. Joseph Spit is narrow and curves northward from Cape San Blas about 15 miles. The spit is covered with hookshaped beach ridges.

The beaches vary from a few feet to several hundred feet in width. Beach material is available nearly everywhere. Most of the beach sand is white and medium fine and consists of more

than 98 percent quartz. The foreshore of most beaches drops off at a rate of about 20 feet per mile. The slope fronting St. Joseph Spit drops off at about 30 feet per mile. St. George Sound, Apalachicola Bay, and St. Vincent Sound are shallow. Deep water is approximately 15 feet, 10 feet, and 6 feet deep in each place, respectively. St. Joseph Bay has depths up to 35 feet or more in places.

The mean range of tides in this area is about 1.5 feet. The shoreline of the coast is exposed to the maximum effects of winds from the southeast, south, and southwest. In general, the predominant direction of coastline currents and movement of material along the west coast of Florida is from east to west. Local reverses occur as a result of the shoreline configuration, and short-time reverses are caused by changes in the direction of waves. The west end of the eastward extension of St. George Island has an east-

TABLE 2.26
Summary of Reported Loss of Life and Hurricane Damages
East Central Gulf Coast

Date hurricane crossed coast	Crossed coast in vicinity of	Vicinity			Total reported damages (\$1,000)	Loss of life ¹
		Mississippi coast (\$1,000)	Mobile, Alabama (\$1,000)	NW. Florida (\$1,000)		
Oct. 2, 1893	Pascagoula, Miss.	--	150	--	150	1,500
July 7, 1896	Fort Walton, Fla.	--	--	400	400	0
Aug. 15, 1901	New Orleans, La.	12	100	112	224	10
Sept. 27, 1906	Pensacola, Fla.	--	1,650	3,415	5,065	151
Sept. 20, 1909	Houma, La.	1,035	14	--	1,049	2350
Aug. 11, 1911	Pensacola, Fla.	--	--	12	12	0
Sept. 14, 1912	Mobile, Ala.	--	12	25	37	1
Sept. 4, 1915	Apalachicola, Fla.	--	--	25	25	0
Sept. 29, 1915	New Orleans, La.	1,500	75	--	1,575	3275
July 5, 1916	Gulfport, Miss.	140	2,425	1,000	3,565	13
Oct. 18, 1916	Fort Walton, Fla.	--	10	100	110	0
Sept. 28, 1917	Pensacola, Fla.	--	--	170	170	5
Sept. 15, 1924	Port St. Joe, Fla.	--	--	100	100	0
Sept. 20, 1926	Perdido Beach, Ala.	200	5,000	4,374	9,574	44
Sept. 30, 1929	Panama City, Fla.	--	--	210	210	2
July 31, 1936	Fort Walton, Fla.	--	--	670	670	4
Oct. 7, 1941	Carrabelle, Fla.	--	--	340	340	5
Sept. 19, 1947	New Orleans, La.	17,478	1,212	310	519,122	634
Sept. 4, 1948	New Orleans, La.	140	88	12	240	0
Aug. 30, 1950	Gulf Shores, Ala.	--	500	550	1,050	1
Sept. 26, 1953	Fort Walton, Fla.	--	--	200	200	0
Total		20,505	11,236	12,025	43,888	2,355

NOTES: ¹ Includes fatalities in Louisiana.

² Three fatalities were in Alabama and Mississippi, the remainder were on Louisiana coast.

³ Eighteen fatalities were on the Mississippi coast.

⁴ An additional 238 fatalities were in peninsular Florida.

⁵ Includes \$122,000 damages to navigation aids, not itemized by States.

⁶ Including deaths in southern Florida, the total was 51.

TABLE 2.27
Maximum Hurricane Tides
 (elevations in feet above mean sea level)

Date hurricane crossed coast	Crossed coast near	Panama City, Florida	Apalachicola, Florida	Carabelle, Florida	St. Marks, Florida
Sept. 27, 1906	Pensacola, Fla.	6.0	5.0	---	---
Sept. 4, 1915	Apalachicola, Fla.	---	4.0	7.0	---
Sept. 20, 1926	Perdido Beach, Ala.	6.0	3.5	---	---
July 31, 1936	Fort Walton, Fla.	4.7	---	---	---
Oct. 7, 1941	Carabelle, Fla.	2.2	1.1	4.8	6.4
Sept. 19, 1947	New Orleans, La.	3.5	5.2	6.0	5.7
Sept. 4, 1948	New Orleans, La.	3.0	3.6	3.8	4.9
Aug. 30, 1950	Gulf Shores, Ala.	5.0	6.8	4.5	4.7
Sept. 26, 1953	Fort Walton, Fla.	4.7	5.0	6.4	5.7
Sept. 24, 1956	Fort Walton, Fla.	5.0	3.8	---	5.6

ward littoral drift. Farther west near St. Joseph Spit, the drift is from south to north.

From Apalachee Bay westward to New Orleans, the hurricane season lasts from mid-June to mid-November and the greatest number of storms occurs in the months of August and September.

Existing Facilities and Programs

Beach Erosion Control

There are no significant beach erosion control

facilities in the basins.

Hurricane Protection

The Weather Bureau furnishes advance warnings when a hurricane is approaching and has a good chance of reaching a coastal area. The Weather Bureau also provides information on expected conditions within the hurricane, such as wind speeds, abnormal hurricane tides, probability and extent of flooding, and other pertinent data.



Figure 2.59 Erosion Has Widened the Bob Sikes Channel, St. George Island.



Figure 2.60 Active Beach Erosion Has Moved the Shoreline into Timbered Areas at Cape San Blas, St. Joseph Spit.

Needs and Opportunities

Beach Erosion Control

Beach erosion involves the removal or shifting of beach materials by wind and wave action, tidal currents, or coastwise currents. A beach is transitory and is molded and remolded with every breaking wave. Where shores are undeveloped, or where development occurs well back from the shore, variations in the beach cause little concern. However, beaches, dunes, and the low areas adjacent to the shore are becoming increasingly important for development of recreation and for construction of homes. Shoreline modifications by erosion and accretion have important effects on the associated animal and plant life. Changes may be economically important to the shellfish industry and physically and biologically important to wildlife.

At many places along this coast, beach erosion and accretion processes change rapidly. Erosion predominates over the eastern one-third of St. George Island. In the middle section the shoreline is fairly stable. From about a mile east of Bob Sikes Channel to Cape St. George, erosion and landward migration has been continuous. West of the Cape, the island has moved gulfward.

St. Vincent Island has undergone accretion and migration along its eastern end to within 2 miles of its western end. Accretion has occurred westward toward Cape San Blas. Cape San Blas is extending to the south. St. Joseph Spit has undergone erosion and eastward migration for most of its length. The north end of St. Joseph Spit has extended 2,500 feet in the 65 years of record. Erosion is basically a natural problem, but it has been aggravated by navigation improvements, shoreline construction, and even by ill-planned erosion control efforts. Beach profiles in many places are frequently altered drastically in a single storm. Some movement of the shore has occurred along all of the coastline of the basins.

Hurricane Protection

The coast is subject to direct assault by hurricane wind, waves, and tidal surge. The best way to prevent loss of human life in coastal areas during a severe hurricane is to evacuate the residents before an oncoming hurricane can en-

danger lives or cut people off from safe high land. Many areas along the shoreline could be inundated by as much as 5 to 10 feet by hurricane tide and wave action during the passage of a major hurricane.

Early evacuation of low areas is imperative, because many of the evacuation routes are subject to early inundation as tides rise along the coast as the storm approaches. Hurricanes along the Gulf coast have taken many lives and caused heavy property losses.

Since all of the coastal areas are expected to experience a great increase in urban development and recreational use by the year 1975, facilities for beach erosion and hurricane protection need to be installed before this date. This would necessitate initiating a cooperative survey to determine all the elements of the problem. The survey would need to consider all influences such as tides, offshore currents, hazards from hurricanes, winds, and places of immediate danger.

Means of Meeting the Needs

Beach Erosion Control

Beach erosion protection can be accomplished by adding sand artificially, and possibly augmenting the sand addition by auxiliary structures. Artificial nourishment itself has the least adverse effect on a locality and appears to offer the best solution, provided a sufficient quantity of material for beach nourishment is available. Wind-erosion protection can be provided by vegetation or sand fences. Both are effective in forming and stabilizing dunes. Dunes act as barriers to high water and strong onshore winds, but they are more important as a source of beach material.

Wave action resulting from storms is the main cause of shoreline changes. Hurricanes, being violent storms, frequently cause rapid and extensive shoreline changes. In addition to those changes, damages from hurricanes include tidal inundation and wave action from above-normal water levels. Hurricane surges, the raising of the water level resulting from lowered barometric pressures, wind stress on the water, and occasionally the configuration of the shoreline often raise the water level at the shore to disastrous heights.

The Federal Government, through the Corps of Engineers and the U. S. Geological Survey, cooperates with the States and other public groups in making beach erosion studies. Because of the many factors involved and the possible effects of one beach upon another, no specific remedial measures can be proposed for the erosion problems of these beaches without such a study.

Hurricane Protection

Occasionally, natural events create high tides and winds of hurricane force which take lives and destroy property, particularly along the ocean shore and lower coastal areas. These problems can be met by recognizing that high tides from strong winds will occur from time to time, by maintaining or improving avenues of escape, and by maintaining warning facilities. New residents and the representatives of industries planning to move into the coastal areas should be informed of such hazards and appropriately advised of probable safe locations which could withstand these infrequent storms.

The recent advent of Federal assistance in hurricane protection has presented new opportunities for the development of coastal engineering criteria and has stimulated further research. Multiple-purpose planning in solving coastal

problems is increasing. Such planning involves coordinating stabilization, navigation inlet channel improvement and maintenance, and hurricane protection. Projects of this type are likely to develop in the future along the Gulf shores where barrier beaches are prevalent.

In plans for developing the coastline into concentrated residential or resort areas, development could be facilitated by consideration of:

- (1) Adequate hurricane-warning systems, hurricane plan of action, and evacuation routes;
- (2) Methods of reducing the potential danger or preventing additional future hazard areas by proper zoning, planning, and construction codes;
- (3) Protecting sewage-disposal facilities from flooding and preventing contamination of water supply;
- (4) Provision of auxiliary power supplies and alternative communication systems; and
- (5) Protective seawalls or similar structures to reduce the danger of damage from high waves.

The adoption of any plans for shore protection would be undesirable without a thorough and complete study of the existing conditions, their causes and effects, and possible remedial measures which would provide protection for existing waterfront improvements, as well as the remaining beach area.

PART THREE - COMPREHENSIVE PLANNING

The procedures used in developing the comprehensive and coordinated plan are briefly summarized in the following four steps: (1) An inventory was made of basic resources and related developments within the basins; (2) needs for goods and services were projected to the year 2000 for the Apalachicola-Chattahoochee-Flint basins; (3) alternative ways to meet needs for each purpose were studied; and (4) projects and programs that would best serve all purposes and meet projected requirements for resource conservation, utilization, and development were selected.

The character and effect of plans in other basins were considered in connection with the formulation of the Apalachicola-Chattahoochee-Flint basins plan, and adjustments were made to permit optimum interbasin uses. Throughout the planning process, many factors such as those associated with geology, hydrology, engineering practices, and social characteristics are expressed in economic terms for convenience in making comparisons. Additional information on planning and plan formulation is provided in the Planning, Economics, Hydrology, and Engineering and Cost Appendixes.

SECTION I - OBJECTIVES AND GUIDELINES

Objectives and specific planning guidelines adopted to govern the study and Report follow.

(1) A coordinated comprehensive plan for the development of the land and water resources of the Southeast River Basins through the year 2000 will be presented in the Report.

(2) The comprehensive plan will be recommended to the Governors and legislatures of the States of the study area and to the President and the Congress for use as a guide for land and water resources development in the Southeast River Basins area.

(3) The plan will set forth an early action phase which will include projects and programs found to be needed, feasible, and desirable for accomplishment by 1975.

(4) It will be recognized that additional studies of recommended programs and projects may be required to support specific requests for State and Federal support and for development by private agencies.

(5) All of the purposes enumerated in the Act will be given equal attention. In the completed plan, each purpose will be developed to that level consistent with the needs and economic capacity of the individual basin. Treatment of industrial development will be limited generally to indications of the effects of the plan on rates of development and to development implied in the projections of manufac-

turing employment. Recreation studies will be limited to public outdoor recreation related to land and water resources and to types beyond those normally provided by individuals and municipalities. Public health studies will be oriented toward determining the effects upon public health associated with the development of land and water resources.

(6) In determining the composition of the comprehensive plan, each separable component will be considered on the basis of the contribution that it makes in net benefits to the Apalachicola-Chattahoochee-Flint basins, the Southeast River Basins, and the Nation. When intangible considerations play a major part in the decisions affecting an element of the program, they will be explained as fully as possible in narrative form.

(7) The comprehensive plan will: Provide information on benefits and costs, including monetary and nonmonetary values; contain information on the expected economic impacts created by the recommended elements of the plan; include general recommendations on cost sharing, reimbursement, and project payout; designate whether recommended developments should be implemented primarily by non-Federal or Federal entities; and designate which of the Federal agencies has the major responsibility for the Federal aspects of a project or program.

(8) The comprehensive plan will recognize and protect the rights and interests of individuals and of the States in determining the development of land and water resources and the preservation and protection of established uses.

(9) The comprehensive plan will include the existing, authorized, and formally proposed works and programs of the Federal and non-

Federal agencies with proposed modifications limited to those found desirable, feasible, and consistent with the study objectives.

(10) Recommendations will be made for periodic review of the comprehensive plan. This review will serve as a basis for keeping the plan current and for subsequent action.

SECTION II - PLANNING ASSUMPTIONS AND CRITERIA

Assumptions

The comprehensive plan is based upon a series of assumptions. The broadest of these are: (1) That the Nation is entering a period of relative stability in international relations with no worsening of the cold war and no widespread outbreak of hostilities; and (2) that throughout the period covered by the plan, to the year 2000, the Federal Government and non-Federal interests will cooperate in encouraging and implementing economic growth and development throughout all segments of society and all areas of the Nation.

Population Growth

Three principal assumptions concerning the rate of national population growth were adopted: (1) The present fertility level, 1955-57 average, will remain constant to sometime between 1975 and 1980, then decline to the 1949-51 level by 2005-2010; (2) there will be moderate declines in mortality rates to the end of this century; and (3) net migration from abroad will be constant at about 300,000 per year. State and area population estimates were made in conformance with the general assumptions, but special attention was given to conditions reflected by study and analysis of individual areas.

Economic Growth and Development

The assumptions concerning trends toward world peace and United States and regional population growths are paralleled by assumptions of upward trends in employment, production, consumption, and foreign trade. For planning purposes, the following projection of gross national product was adopted: The 1960 gross national product of about \$500 billion will in-

crease to \$888 billion by 1975 and to \$2,300 billion by the year 2000.

A continuation of the trend toward more red meats and more of some fruits and vegetables in the human diet is reflected in the projections and plans for food production and land use. It is believed that per capita consumption of food will increase until about 1975 and remain about constant thereafter.

In line with the general expansion of the national and regional economy, it was assumed that investment capital required to attain projected industrial growth and resource development will be available and that the education and technical skills necessary for an expanding industrial economy also will be available. It was further assumed, as a working procedure for preliminary studies, that land and water resources and electric-power supply would not be limiting factors in attaining the projected economy of the Apalachicola-Chattahoochee-Flint basins.

It was recognized in the study of the Apalachicola-Chattahoochee-Flint basins that their economy is an integral part of the regional and national economies.

National and Regional Viewpoints

Because of the widespread effects of land and water resource development, a responsibility falls on all levels of government and on the private economy to participate in resource planning and in the execution of resource programs.

In developing the Southeast River Basins plan, national needs for food and fiber and for services are included at those levels warranted by the comparative advantage and existing economic potential of the Southeast River Basins area in relation to national resources and needs. Thus, the primary benefits shown for projects

and programs provide a means of indicating project efficiency from the national point of view as well as a principal measure of regional and local benefits. Secondary benefits and impact studies provide additional evidence of the regional and local effects of resource development.

In developing projects and programs in the Apalachicola-Chattahoochee-Flint basins plan, consideration was given to national policy guides pertaining to land and water resources development that have resulted from legislation and to administrative policies or decisions that have prevailed. Policy guides and statements of national objectives used in the planning processes are discussed in the technical appendixes.

Criteria

Price Levels

Price levels prevailing in or about January 1960 were used for evaluating all present and future benefits and costs, except that an adjustment was made in agricultural prices based upon an assumption of a long-range parity ratio of 89 between prices paid and prices received by farmers.

Interest Rates

An interest rate of 2 $\frac{1}{2}$ percent was used as far as practicable in analyzing costs and benefits in project formulation. In certain instances, benefits and costs were extracted from available data, and it was impractical to adjust this interest rate when the interest-rate mix of the data was uncertain. The 2 $\frac{1}{2}$ percent interest rate meets the need for a relatively risk-free and inflation-deflation-free rate for use in evaluation of the economic effects of Federal resource projects and programs. For converting certain non-Federal costs and benefits to an annual equivalent basis, a 4 $\frac{1}{4}$ percent interest rate was used.

Life of Projects and Period Covered by Analysis

The period of analysis used in the studies for this basins Report was the economic life of each project, or 50 years, whichever was the lesser. The possibility of a longer maximum period, up to 100 years, was considered in recognizing certain long-range effects of intangibles and other impacts, but effects beyond 50 years were not evaluated in monetary terms.

The plan was formulated to meet only those needs expected to develop to the year 2000, and the evaluations generally reflect no increase in use of facilities after the year 2000. Needs will naturally continue to grow after the year 2000, and many of the proposed projects and programs, by adding facilities, will have the capacity to absorb some of the growth. The potential of the plan to meet needs that develop after the year 2000 has not been evaluated.

The assumptions and criteria used are considered conservatively low. If more liberal criteria had been used, such as a period of analysis of 100 years and an increasing need after the year 2000, the projects and programs included in the plan would appear even more favorable.

Basis for Comparison of Projects Effects

Comparison and evaluation of the proposed projects and programs in the plan were made to determine the most effective use of economic resources, such as land, water, labor, and materials. In this way, actions and opportunities throughout the economy form a check on what is economically justified in the way of new plans and efforts.

The value of the projects or programs included in the plan are computed on the basis of future conditions "with" the projects or programs included in the plan as compared to future conditions "without" the projects or programs included in the plan.

The future "with" conditions for individual project or program analysis include all development which would be expected to occur during the period of analysis with the project in existence.

The future "without" conditions include all developments that are existing or under construction as of January 1960, assuming adequate operation and maintenance of those developments. Technological gains not directly associated with the projects and programs in the basins plan were recognized as part of the "without" condition. It was assumed that no part of the projects or programs would develop in the absence of the project or program. This is not to deny that, in the absence of the proposed plan, other plans would develop which might include many features similar to those in the recommended plan.

Timing of Development

Plans covering long periods into the future provide for needs which have not yet developed. Not all developments are needed at once or at the same time. Plan implementation should, therefore, be scheduled to meet the needs as they occur. A precise schedule of year-to-year development was not considered necessary, but a general order of priority was established. Those developments needed first are included in an early action phase and are generally based on filling the needs to the year 1975. If need arises, however, projects scheduled in the 1975-2000 period may and should be initiated earlier. Likewise, the rate of project initiation may be slowed down if conditions warrant slower action.

Discount Principles

Program or project benefits and costs, which are estimated to accrue at different times and over varying periods of time, were converted from capital values to annual equivalent values by use of compound interest or discount rates. The resulting values reflect the present worth at the inception of each program or project and provide a common basis for measurement.

Benefits

The ultimate aim of resource projects and programs, in common with all other productive activity, is to satisfy human needs and desires. Goods and services are produced to achieve this end. These goods and services have value in accordance with the demand for them and their availability. Benefits are of two general kinds, primary and secondary. Primary project benefits are the increase in the value of goods or services directly resulting from a project, less all associated nonproject costs incurred in their realization. Primary benefits are usually evaluated at the first point in the chain of effects of a project where the goods or services produced have an actual or estimated market value. Secondary benefits are the value of goods and services created in secondary activities affected by the project, less all associated costs incurred in their realization. The major part of the value of these goods and services is not measured from the national public point of view because it is assumed that an investment similar to that made

in the project would create a similar effect in secondary activities if invested in other projects or other areas. However, overall secondary benefits are considered appropriate in illustrating the significance of projects from a regional point of view.

Primary Benefits

The primary tangible benefits, which in this Section are referred to as primary benefits, represent the estimated increase in the value of the actual goods, services, and satisfactions of a project or program expected for the period under study and from which any induced losses to other projects or programs have been deducted.

The facilities included in the plan for drainage, irrigation, and soil conservation are based on the increased net return to the farmer from the estimated production response.

The primary benefits from drainage and flood-loss prevention, resulting from the upstream watershed projects, are derived from net values for expected changes in land use, the increased productivity of land, the reduction of direct damage to agricultural crops and fixed improvements, and reduction of management costs.

The primary benefits from hydroelectric power are estimated as the cost of equivalent power from a modern steam-electric powerplant.

Primary benefits from the forestry program are estimated as the net stumpage value of increased production and the net leasing values received from the increased number of faces expected to be worked for production of gum-naval stores.

The primary benefits of the commercial fisheries program are the estimated value of increased landings of commercial fish.

Primary benefits from the sport fisheries and wildlife program are the estimated value of projected increases in user-days of hunting and fishing.

Benefits used in the monetary evaluation of the recreation program consist of the estimated value of increased user-days of recreational activity.

The benefits for domestic, municipal, and industrial water supplies are assumed to be at least equal to the cost of obtaining water of similar quality and quantity from the cheapest alternative source and are evaluated in mone-

tary terms only for water supply storage in multiple-purpose reservoirs.

Primary benefits of flood control are derived from the difference between flood losses "with" and "without" protection. For upstream watershed and local protection projects, enhancement and restoration benefits are also included where applicable.

Primary benefits of navigation are measured by savings in rate differential; the savings in shipping time; the reductions in operation and maintenance costs; and the value of any filled land obtained through spoiling.

Justification of programs for vector control, solid-waste collection and disposal, air pollution and radiation monitoring, and pollution abatement, except storage for augmenting low streamflows, is found in intangibles. In multiple-purpose projects including storage for dilution purposes, the pollution abatement benefits were taken as equal to the average cost of tertiary treatment to provide the same improvement or protection of water quality as that obtainable by dilution.

Secondary Benefits and Impacts

Although for purposes of this study a monetary evaluation of secondary economic effects of various resource projects and programs was not made, the importance of these secondary effects of resource development was recognized.

The projects and programs involving increased production of commodities will require additional raw materials, processing equipment, and more services to sustain the processing operation. These increased activities will extend throughout the basins. Trades and services especially would be stimulated by recreation, sport fishing, and wildlife developments. These impacts would particularly affect fishing camps, marinas, commercial boat docks, motels, sporting goods stores, service stations, boat dealers, restaurants, and many related new businesses.

Construction projects create a temporary influx of workers who spend money in local areas, but at the same time, such projects will create problems of housing, schooling, transportation, and other community services. The solution of these short-term problems should result in long-range gains with construction of facilities that would be needed to meet future expansion.

There are 38 counties out of a total of 77 counties either wholly or partially within the Apalachicola-Chattahoochee-Flint basins which have been designated redevelopment areas as of April 1962 by the Area Redevelopment Administration of the U. S. Department of Commerce. Of the 38 counties, 4 are in Alabama, 5 are in Florida, and 29 are in Georgia. These counties were so designated because of varying reasons such as low median-family income, low production farming, and persistent and substantial unemployment or underemployment. Development of the plan for the Apalachicola-Chattahoochee-Flint basins would assist in the relief of these conditions and aid in raising the economic level of the people. Substantial net secondary benefits are most frequently realized in areas where resource development projects make it possible to utilize unemployed and underemployed labor and unused facilities and resources.

Intangible Benefits

Intangible benefits are those which are not evaluated in monetary terms. Like tangible benefits, these may be primary or secondary in character. Many programs and projects make substantial contributions to public security, to private and public health, and to public safety and tranquility, all of which include large elements of intangible value. Intangible benefits and costs are recognized in programs and projects analyses.

Costs

Costs are the value of labor, goods, and services exchanged to gain goods and services valued more highly. Where the costs are tangible values, the assumption is made that the needs of the project are, in the aggregate, taken from present uses at marginal unit prices and, therefore, the values foregone represent the least important uses that the market would allow. In a resource program as complex as that recommended for the Southeast River Basins, there are also many intangible costs involved.

The costs of proposed projects and programs include the initial investment which would be incurred in one or more stages of construction and the annual expenditures required for operation, maintenance, and replacements. Taxes which would be paid by a private utility were

included as a project cost for hydroelectric power projects without regard to whether governmental or private interests would develop the project. Investment costs include the capital expenditures associated with constructing a project and carrying out a program. Where the period of construction was estimated to be more than 2 years, the investment included simple interest on one-half of the construction costs for the period of construction.

Capital investment and operation and maintenance costs of multiple-purpose projects were allocated to the several purposes served so as to form a basis for reimbursement and cost-sharing arrangements that may be required.

Intangible Costs

In evaluating resource projects and programs, many important effects cannot be adequately measured in monetary terms. Loss of scenic values is an example of an intangible cost frequently associated with resource development. Treatment of these intangible effects has been subjected to many of the requirements applicable to tangible effects. These include: (1) Considering effects in terms of difference "with the project" and "without the project," and (2) considering intangible costs to the same degree or extent as intangible benefits.

Cost Sharing

Cost sharing is concerned primarily with the distribution of costs among the participating interests. The division of cost is shown in two groups: Federal and non-Federal. For each specific project or program, the actual division of cost among the Federal and non-Federal interests was determined by the nature of the development and on the basis of circumstances expected to prevail during the evaluation period.

Generally, where the impacts of projects and programs are largely local, the costs are the responsibility of non-Federal interests. Projects and programs of national significance are the responsibility of the Federal Government. Between these two extremes there are a number of projects and programs where the costs are to be shared by the Federal and non-Federal groups.

In determining the degree of Federal participation in projects and programs of less than national significance, consideration was given

to: (1) The need for demonstrating new approaches to resource development and use; (2) the usefulness of a local project or program in research and experimentation which has more than local implications; (3) the support of projects or programs which by policy or legislation have become accepted as Federal or part Federal responsibilities, such as flood control; and, (4) the possible justification for Federal participation in the cost of local works and improvements where counties, areas, or regions are designated as distressed and in need of economic assistance.

Financing

Determining effective ways for financing land and water development is an essential part of resource planning. Financing as used here relates to the immediate source of funds needed for construction and management of proposed works. Financing requirements were developed only as Federal and non-Federal although in the analyses, State, county, municipal, and private financing were considered. Special groupings for purposes of financing, such as development corporations and special improvement districts, are also discussed.

The following criteria were used in determining appropriate methods for financing land and water resource developments.

(1) Developments of natural resources that do not involve national consideration will be the responsibility of private, local, and State interests.

(2) Where the costs of projects and programs are to be shared between the Federal and non-Federal interests, each will provide for the financing of its share, except as noted under item (3) following. The Federal share will be provided under such laws and regulations as are applicable at the time of financing. In addition to direct government and private appropriations for the non-Federal share, development funds, authority funds, special bond issues, and revenue bonds are available for financing.

(3) For projects such as hydroelectric power and water supply, Federal financing may be needed, with provision for reimbursement from non-Federal beneficiaries, as is now practiced. Federal financing may also be required for projects of the types not adequately covered by traditional approaches. This includes large-scale

recreation projects and some types of fish and wildlife work.

(4) When the Federal Government assumes

the full cost of a project or program, the Federal Government will be responsible for full financing of the work.

SECTION III - PLAN FORMULATION

Selecting and fitting planning segments together and considering alternatives in the search for the proper programs, the proper number of projects, and the best size for each element of the overall plan required extensive analysis. By a series of approximations using the incremental approach and limited by alternative consideration and judgment, a plan was formulated containing those programs and projects that will usually result in maximum benefits above costs in meeting needs to the year 2000.

General Character of Resource Planning

Generally, resource planning recognizes the consequences of land and water resource development and the need to anticipate the future requirements for land and water essential to growth and welfare. The physical and economic aspects of the planning task have been emphasized, particularly as they relate to the scale, sequence, and timing of development plans. However, these considerations have been tempered by the recognition of social, legal, and political factors.

The plan has been developed on the basis that free enterprise persists in the area and the Nation with Federal and State Governments undertaking those tasks which are beyond individual or voluntary group capacity or which require such action for special physical, economic, social, or other reasons. Local and regional viewpoints were recognized in formulating the plan.

Guides for Plan Formulation

A number of general land and water resource development guides and planning aids were used in weighing and selecting those alternatives which were fitted into an effective plan. In all cases, the effective use of these guides and planning techniques required careful adherence to the assumptions and criteria outlined in Section II.

Plan Evaluation

Comparison of benefits with costs was one of the principal guides used in plan formulation. These comparisons attempted to cover all beneficial and adverse effects. While favorable primary tangible benefit-cost relations were generally the principal basis used in selecting programs and projects, intangible costs and benefits were also considered in making the plan. Measurements made reflected existing and probable future economic conditions, including estimates of the probable needs for the many goods and services which land and water development make possible. Benefit-cost data were applied to a range of interdependent physical and social possibilities and the resulting scale used for judging and selecting the means of development, the scope of facilities needed, and the site or area involved.

Increments and the Scale of Development

To achieve a reasonable scale of development, it was necessary in the formulation process to divide the work into manageable units. Planning units, usually called separable segments or increments, were the smallest units on which there was a practical opportunity for inclusion in or omission from the plan.

To meet the general objectives of maximizing net economic returns and satisfactions from the economic resources used in the plan, each part of the plan was formulated to include each separable segment or increment which would provide benefits at least equal to the cost of that segment or increment with full consideration of intangible values. The plan formulation was considered completed when it was demonstrated that: (1) There was need for the goods and services produced, (2) each separable segment or purpose provided benefits at least equal to its cost, (3) the scale of total development was such as to provide the maximum net benefits, and (4) there were no more economical means of accomplishing the same purposes.

The Nucleus Plan and the Multiple-Purpose Concept

A specific initial proposal generally was chosen as the nucleus around which planning proceeded. This nucleus usually represented a project or program which seemed to offer promise of meeting a major objective or objectives.

After the initial proposals of development were selected for analysis, and benefits and costs measured, consideration was given to larger or smaller scales of development. Variations in the scope of each separable increment were made and tested, and the possibility of additions or omissions examined. Early in this process, the possibility of multiple-purpose projects was considered. By the process of elimination, the most promising combination of projects and programs was identified and tested to determine where a justified nucleus had been found. The incremental analysis was continued by adding segments of size, purpose, or means, and by evaluating the resulting increments of benefits and costs. Thus, the incremental analysis was a series of comparisons of alternative plans "with" and "without" the inclusion of particular segments. Short cuts were frequent and necessary but these principles were followed. By this fitting process, modifications were made in the initial plan. This process was continued within practical limitations until the best combination was evolved to meet the established needs.

Sequence of Development

The sequence of project development is basic to maximizing overall project benefits. Project benefit and cost comparisons are misleading unless they represent the incremental benefits and costs of projects in a specified sequence of development. This problem was recognized in the studies by dividing proposed developments into those requiring early action and those which could be accomplished by later action. Further refinement in timing could lead to some changes in incremental benefits and costs.

General Information and Basic Data

Some of the general information essential to planning in the basins was available, but not always in the most useful form. Much of it required reorganization prior to analysis. While little original research was undertaken, professional interpretation of data and problems was

frequently sought in the planning processes. The available data on past and current programs and on resource plans underway by Federal, State, and, to some degree, private agencies became a part of the basic planning information.

As the studies progressed, the lack of certain basic data became increasingly evident. Adequate topographic maps with satisfactory contour intervals and horizontal scales for planning, such as the 7½-minute quadrangle sheets, were available for about one-third of the basins. Hydrologic data are available, on at least a short-term basis, for most major streams, but little data are available for small tributaries. Ground water information is meager. Only limited data are available on water quality. Geologic information is limited to local areas and to generalized data. Pertinent economic statistics have been less than adequate, except during recent years. Much of this lack of data can be attributed to the fact that most of the basins have never approached full development of their resources. Consequently, there has been minimum effort to collect basic data. However, greater competition for resource use is beginning, and selection between uses will be increasingly important as the demands increase. Adequate basic data are essential in making proper selections; therefore, steps need to be taken to insure that information will be available when it is critically needed.

Single-Purpose Planning

Single-purpose planning for each purpose was carried to the point of establishing needs and determining most likely ways of meeting the needs with the least expenditure of resources. Studies for some purposes were carried into more detail than others in examining alternative ways of meeting needs. Where it was apparent that a single-purpose plan could be used without major modification in the comprehensive plan, the single-purpose studies were carried to more detail than in those cases where the purpose would be included, with perhaps major modifications, in a multiple-purpose development.

Multiple-Purpose Planning

Information developed in single-purpose planning and the special problems of the area were

the initial bases for development of a multiple-purpose plan for the Apalachicola-Chattahoochee-Flint basins.

The programs and projects which served as nuclei for the initial planning were based on the character of the resources, the nature of the problems, and the nature of the land and water projects already established or planned as portrayed in the single-purpose plans. Proposals considered for the inclusion in the plan came from many sources. Citizens throughout the area and local development organizations expressed interests in projects of many kinds and suggested combinations of resource use and development which they believed would meet particular needs. Federal and State agencies were also the source of much information on possible projects and project combinations.

Consideration was given to complementary land and water uses. Following the development of single-purpose ways for meeting needs, studies of compatible resource uses and areas of potential conflict in resource use were made. It was found that needs for forestry, recreation, and fish and wildlife could frequently be met by proper utilization of the same land resource. Similarly, water resource development plans could acceptably serve the purposes of flood control, hydroelectric power, water supply, fishing, and recreation, although operating adjustments had to be considered so that the most favorable multiple-purpose operating arrangements could be assured to maximize overall net benefits.

When sufficient preliminary study had been made, a series of detailed studies were undertaken to choose from among the alternatives those filling the needs most effectively. In this process, the problem of deciding among competing uses sometimes arose and there was always present the need to seek arrangements whereby the greatest play of complementary values would occur. This process involved a repetitious series of adjustments, in varying degrees of refinement, combined with progressively refined economic, hydrologic, and engineering comparison, until the best combination of proposed developments was found.

Nature and Treatment of Alternatives

In resources planning, comparison of alterna-

tives is a vital part of the planning process. It is necessary to understand the nature of projects and programs rejected and the reasons for rejection, as well as the character of those accepted in the plan. Information on alternatives considered is summarized in Part Four. Additional detail concerning the nature of the alternatives considered and the reasons for their acceptance or rejection in the final plan are included in Appendix 12, Planning.

Competitive Uses

Many resource uses are competitive in character. The principal guidelines established and generally followed in determining the use of land and water resources are summarized as follows: (1) Resource utilization was based on and limited to the projected future needs; and (2) economic efficiency was a major governing criterion in deciding between alternative uses of a given resource, with due consideration given to social, political, and physical factors. Some of the situations requiring special attention are: (1) Existing, reserved, or special use land and water resources; (2) public health; (3) special requirements involving areas that provide a particular type of land or water use that cannot be duplicated elsewhere at a reasonable cost; and (4) those resources to which priority considerations should be given because of long established or firmly fixed development trends.

Adjustment Among Basins in Planning

Interbasin relations were recognized, to the extent practicable, when Southeast River Basins needs were developed and distributed among basins to provide planning objectives for each basin. For example, user-days of recreation demand for a given population center were distributed to all basins within reasonable travel distance from the center, rather than being allocated exclusively to the basin within which the center lies. Nevertheless, a check was made to insure that the overall cost of meeting each need was not inflated by unreasonable disparities in unit costs. Adjustments between the Apalachicola-Chattahoochee-Flint and other basins were made where reasonable alternatives were available and where overall efficiencies could be improved by the adjustments.

PART FOUR – BASINS PLAN

SECTION I – COMPREHENSIVE BASINS PLAN

The coordinated comprehensive plan for the development of the land and water resources of the Apalachicola-Chattahoochee-Flint basins includes all of the resource developments required to meet the needs to the year 2000. The major

physical works associated with the plan are located, geographically, on Figure 4.1. Statistical data are summarized in Tables 4.1, 4.2, and 4.3. Details of the plan follow the summaries.

TABLE 4.1
Comprehensive Plan for Development
(thousands of dollars)

Project or program	Purpose ¹	Benefits Annual equivalent ²	Costs		
			Total	OM&R	Investment
Highlands ³	R, F&W	--	--	--	--
Cedar Creek	P, FC, R, F&W	7,233	3,471	1,007	60,000
Dog River	PA, F&W	335	219	36	5,000
Atlanta Pollution Abatement	P, PA	8,660	4,342	1,861	67,800
Anneewakee	R, F&W	3,890	1,216	669	17,500
West Point ⁴	P, FC, R, F&W	3,792	2,960	398	55,800
Middle Chattahoochee ⁴	P, N, R, F&W	14,190	13,900	1,700	308,700
Columbus-Phenix City ⁴	FC	778	282	22	7,200
Omussee	R, F&W	171	121	40	2,250
Spewrell Bluff	P, N, FC, R, F&W	4,792	3,705	524	67,500
Lazer Creek	P, N, FC, R, F&W	3,810	2,704	429	44,900
Lower Auchumpkee	P, N, FC, R, F&W	3,233	2,819	382	50,200
Lower Flint	P, N, R, F&W	3,166	3,186	557	66,800
Muckalee	FC, WS, R, F&W	296	181	57	3,400
Kinchafoonee	FC, F&W	86	75	20	1,500
Chipola	R, F&W	788	242	149	3,100
Apalachicola Bay	F&W	1,307	787	766	430
Water-access areas	R, F&W	7,860	1,959	1,235	20,000
Upstream watersheds	FC, D	4,200	1,500	400	30,400
Flood control levees	FC	462	251	65	5,200
Water supplies ⁵	WS	6	25,400	17,450	362,600
Irrigation	I	847	590	505	2,350
Drainage ⁵	D	544	63	41	600
Soil conservation	SC	7,030	5,490	3,323	59,900
Forest conservation	F	5,715	4,331	1,371	127,800
Fish and wildlife ⁵	F&W	11,440	6,620	5,329	35,800
Recreation ⁵	R	23,440	6,920	4,167	100,100
Pollution abatement ⁵	PA	7	12,000	2,300	395,200
Public health	PH	7	5,230	5,000	9,400

NOTES:

¹ FC—Flood control I —Irrigation F&W—Fish and wildlife
 WS—Water supplies P—Hydroelectric power R—Recreation
 N—Navigation SC—Soil conservation PA—Pollution abatement
 D—Drainage F—Forest conservation PH—Public health

² Primary tangible only; intangible and secondary tangible benefits and impacts considered are presented in narrative.

³ The project would be located in these basins and in the Savannah basin. Total benefits and costs are shown in Appendix 1, Savannah Basin.

⁴ The project or program would be located on a boundary between States. Total benefits and costs of the project or program are shown in each State.

⁵ Data presented are exclusive of benefits and costs associated with multiple-purpose projects.

⁶ Benefits are assumed to be at least equal to the cost of the cheapest alternative and are assigned monetary values only for multiple-purpose developments.

⁷ Justification is based largely on intangible benefits except for pollution abatement resulting from dilution water provided by multiple-purpose projects.

APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS PLAN FEATURES

(key to numbers shown on Figure 4.1)

- Highlands Project Area
- 1 Blue Ridge Parkway
- 2 Gold Museum Historic Site
- 3 Unicoi State Park Recreation Area
- 4 Nacoochee Archeological Site
- 5 Lake Sidney Lanier
- 6 Roswell Mill and Town Historic Site
- 7 Morgan Falls Wildlife Management Area
- 8 Kennesaw Mountain National Battlefield Park
- 9 Soap Creek Mill Historic Site
- 10 Dog River Reservoir and Anneewakee Recreation Area
- 11 Ruff Creek Mill Historic Site
- 12 Cedar Creek Reservoir
- 13 Coweta County Wildlife Management Area
- 14 Heard County Wildlife Management Area
- 15 Franklin Reservoir¹
- 16 Senoia State Park Recreation Area
- 17 Randolph County Wildlife Management Area
- 18 Troup County Wildlife Management Area
- 19 West Point Reservoir
- 20 Chambers County Fishing Lake
- 21 West Point Levees
- 22 New Riverview Reservoir¹
- 23 Warm Springs National Fish Hatchery and Recreation Area
- 24 Callaway Gardens
- 25 Franklin D. Roosevelt State Park Recreation Area
- 27 Little White House Historic Site
- 28 Spewell Bluff Reservoir
- 29 Lazer Creek Reservoir
- 30 Crawford-Upson County Wildlife Management Area
- 31 Harris County Wildlife Management Area
- 32 Lee County Wildlife Management Area
- 33 Talbot County Wildlife Management Area
- 34 Lower Auchumpkee Creek Reservoir
- 35 Columbus Reservoir¹
- 36 Columbus—Phenix City Project
- 37 Phenix City Levees
- 38 Taylor County Wildlife Management Area
- 39 Marion County Wildlife Management Area
- 40 Russell County Wildlife Management Area
- 41 Fort Benning Wildlife Management Area
- 42 Muckalee Creek Reservoir
- 43 Providence Canyon Recreation Area
- 44 Kinchafoonee Reservoir
- 45 Neisler Archeological Site
- 46 Eufaula State Wildlife Management Area
- 47 Barbour County Fishing Lake
- 48 Stewart County Wildlife Management Area
- 49 Georgia Veterans Memorial State Park Recreation Area
- 50 Fort Apalachicola Historic Site
- 51 Eufaula National Wildlife Management Area
- 52 Barbour County Wildlife Management Area
- 53 Lake Blackshear Public Fishing Area
- 54 Steve Cocke Fish Hatchery
- 55 Walter F. George Reservoir
- 56 Henry County Wildlife Management Area
- 57 Chehaw State Park Recreation Area
- 58 Lake Worth Public Fishing Area
- 59 Radium Springs Levees
- 60 Radium Springs Recreation Area
- 61 Kolomoki Mounds State Park Recreation Area
- 62 Raccoon Creek Reservoir²
- 63 Newton Levees
- 64 South Henry County Wildlife Management Area
- 65 Omussee Reservoir
- 66 Columbia Reservoir
- 67 Lower Vada Reservoir²
- 68 Houston County Wildlife Management Area
- 69 Chattahoochee State Park Recreation Area
- 70 Bainbridge Levees
- 71 Florida Caverns State Park Recreation Area
- 72 Merritts Mill Pond Public Fishing Area
- 73 Marianna Levees
- 74 Jim Woodruff Reservoir (Lake Seminole) Recreation and Waterfowl and Fish Management Areas
- 75 Bainbridge State Park Recreation Area
- 76 Apalachee Wildlife Management Area
- 77 Decatur County Wildlife Management Area
- 78 Ocheesee Pond Public Fishing Area
- 79 River Junction Levees
- 80 Aspalaga Archeological Site
- 81 Torreya State Park Recreation Area
- 82 Chipola River Recreation Area
- 83 Blountstown Levees
- 84 Chipola River Wildlife Management Area
- 85 Cayson Archeological Site
- 86 Fort Gadsden Historic Site
- 87 Roy S. Gaskin Wildlife Management Area
- 88 Dead Lake Public Fishing Area
- 89 Apalachicola National Forest Recreation Area
- 90 Liberty Wildlife Management Area
- 91 Constitution Convention Historic Memorial
- 92 Lake Wimico Public Fishing Area
- 93 Pierce Archeological Site
- 94 John Gorrie Historic Memorial
- 95 Florida Beaches—Recreation Areas
- 96 Apalachicola Bay Oyster Development

NOTES: ¹ Included in Middle Chattahoochee project.

² Included in Lower Flint project.

APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS PLAN

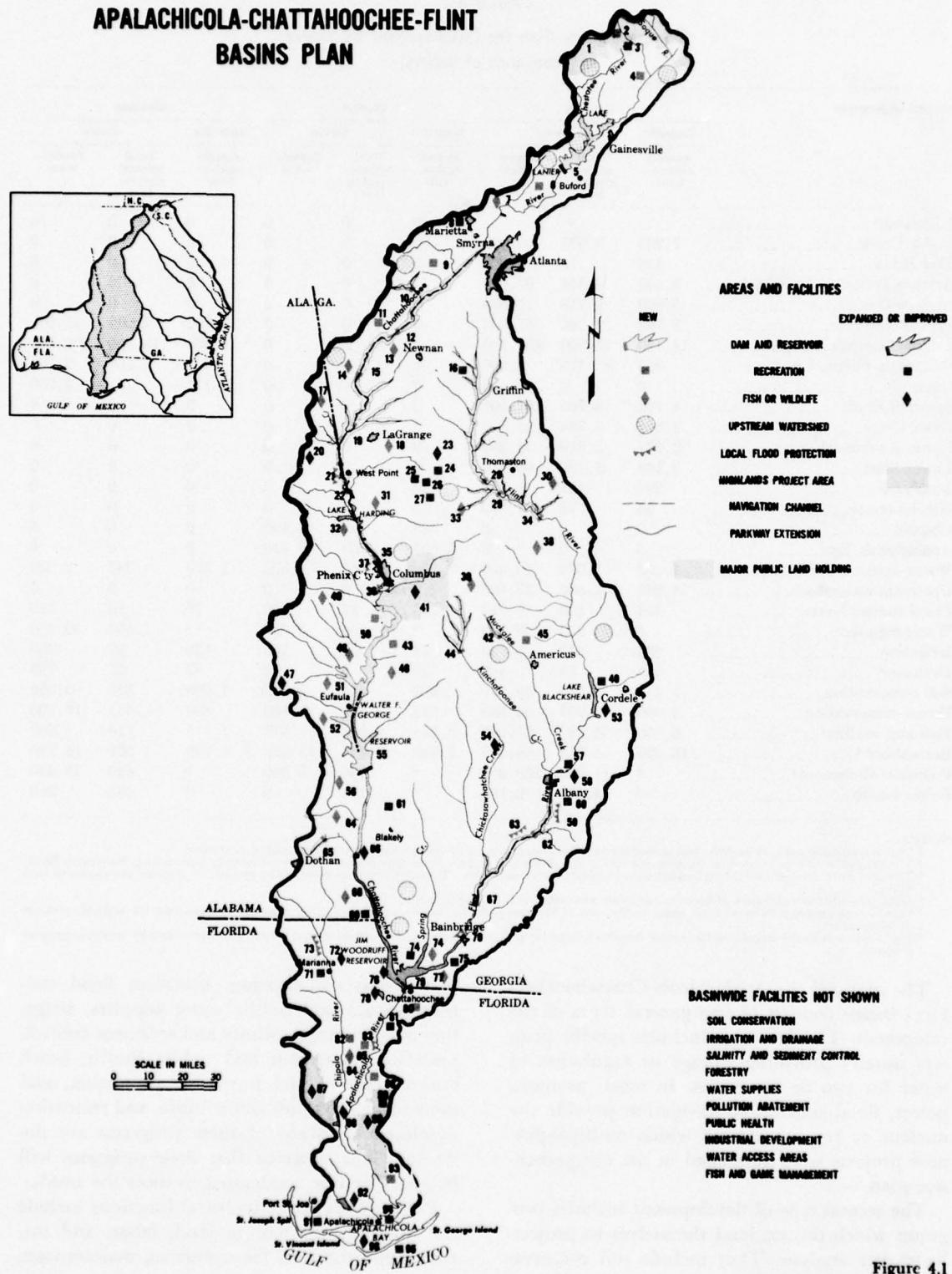


Figure 4.1

TABLE 4.2
Comprehensive Plan for Development by States
(thousands of dollars)

Project or program	Georgia			Florida			Alabama		
	Benefits	Costs	Invest- ment	Benefits	Costs	Invest- ment	Benefits	Costs	Invest- ment
	Annual equiva- lent ¹	Total annual equiva- lent		Annual equiva- lent ¹	Total annual equiva- lent		Annual equiva- lent ¹	Total annual equiva- lent ¹	
Highlands ²	—	—	—	0	0	0	0	0	0
Cedar Creek	7,233	3,471	60,000	0	0	0	0	0	0
Dog River	335	219	5,000	0	0	0	0	0	0
Atlanta Pollution Abatement	8,660	4,342	67,800	0	0	0	0	0	0
Anneewakee	3,890	1,216	17,500	0	0	0	0	0	0
West Point ³	3,792	2,960	55,800	0	0	0	3,792	2,960	55,800
Middle Chattahoochee ³	14,190	13,900	308,700	0	0	0	14,190	13,900	308,700
Columbus-Phenix City ³	303	173	4,500	0	0	0	475	109	2,700
Omussee	0	0	0	0	0	0	171	121	2,250
Spewrell Bluff	4,792	3,705	67,500	0	0	0	0	0	0
Lazer Creek	3,810	2,704	44,900	0	0	0	0	0	0
Lower Auchumpkee	3,233	2,819	50,200	0	0	0	0	0	0
Lower Flint	3,166	3,186	66,800	0	0	0	0	0	0
Muckalee	296	181	3,400	0	0	0	0	0	0
Kinchafoonee	86	75	1,500	0	0	0	0	0	0
Chipola	0	0	9	788	242	3,100	0	0	0
Apalachicola Bay	0	0	0	1,307	787	430	0	0	0
Water-access areas	4,275	1,074	10,950	2,215	540	5,520	1,370	345	3,530
Upstream watersheds	4,200	1,500	30,400	0	0	0	0	0	0
Flood control levees	308	196	4,210	136	37	650	18	18	340
Water supplies ⁴	5	23,510	336,100	5	394	6,020	5	1,596	20,480
Irrigation	634	442	1,760	74	51	205	139	97	385
Drainage ⁴	405	46	442	47	6	50	92	11	108
Soil conservation	5,414	4,260	50,500	533	405	2,500	1,083	825	6,900
Forest conservation	4,009	3,092	90,840	915	688	20,860	800	551	16,100
Fish and wildlife ⁴	6,650	4,387	33,642	3,345	1,514	556	1,445	719	1,602
Recreation ^{3,5}	16,200	4,018	58,470	9,980	3,495	53,320	4,706	1,257	15,770
Pollution abatement ⁴	6	11,200	369,800	6	180	6,000	6	620	19,400
Public health	6	4,675	9,150	6	120	0	6	435	250

NOTES:

¹ Primary tangible only; intangible and secondary tangible benefits and impacts considered are presented in narrative.

² The project would be located in these basins and in the Savannah basin. Total benefits and costs are shown in Appendix 1, Savannah Basin.

³ The project or program would be located on a boundary between States. Total benefits and costs of the project or program are shown in each State.

⁴ Data presented are exclusive of benefits and costs associated with multiple-purpose projects.

⁵ Benefits are assumed to be at least equal to the cost of the cheapest alternative and are assigned monetary values only for multiple-purpose developments.

⁶ Justification is based largely on intangible benefits except for pollution abatement resulting from dilution water provided by multiple-purpose projects.

The plan for the Apalachicola-Chattahoochee-Flint basins consists of two general types of development. The first type includes specific projects usually providing storage or regulation of water for two or more uses. In most instances, power, flood control, or navigation provide the nucleus or key use around which multiple-purpose projects were developed in the comprehensive plan.

The second type of development includes programs which do not lend themselves to project-by-project analysis. They include soil conserva-

tion, forest conservation, upstream flood control, private and public water supplies, irrigation and drainage, salinity and sediment control, pollution abatement and public health, beach erosion control and hurricane protection, and some navigation, fish and wildlife, and recreation development. Many of these programs are underway. It is expected that these programs will be continued or accelerated to meet the needs.

Project costs for agricultural functions include the initial investment in land, labor, and materials and the costs for operation, maintenance,

and replacements required to keep the project or program functioning as planned. These costs were compared with the project benefits. Associated costs as used in these studies were those costs, exclusive of investment and operation, maintenance, and replacements costs of the project or program under study, necessary to the realization of the primary benefits. Associated costs generally were deducted from overall benefits to derive the project or program net benefits.

The investment cost is the total project or program cost necessary to construct a project or install a program and place it in operation. Project investment cost includes all expenditures for detailed planning, design, and construction chargeable to the project or program; the esti-

mated value of any item transferred or furnished without the expenditure of funds; technical assistance; and accrued interest on these items during the construction period. Technical assistance costs for agricultural programs are not included in the cost determination.

The resource developments existing and under construction as of 1960 are a necessary part of the plan to meet the projected requirements. However, only the proposals for new developments and expansion of existing developments to be made during the period from 1960 to 2000 have been evaluated. More detailed data pertinent to project and program accomplishments, plan by purpose, economic analyses, physical features, and implementation of the plan are included in subsequent Sections.

SECTION II – PLAN BY PURPOSE

Many of the proposals in the plan involve benefits and costs associated with more than one purpose. The plan is designed to meet needs of many purposes; it takes advantage of joint-use efficiencies where practicable. The summaries that follow cover the entire plan for each pur-

pose, including both its single-purpose components and the allocated share of the multiple-purpose developments. Details of the multiple-purpose developments and additional data for the single-purpose proposals are included in Section V of this Part.

TABLE 4.3
Plan by Purpose
(thousands of dollars)

Purpose	Benefits Annual equiva- lent ¹	Costs		
		Total	Annual equivalent Operation, maintenance, and replace- ments	Invest- ment
Flood control	6,140	3,844	626	88,110
Water supplies	2	25,572	17,468	364,100
Navigation	10,673	10,975	1,170	272,490
Reclamation, irrigation, and drainage	3,091	911	637	8,550
Hydroelectric power and industrial development	16,224	15,485	2,127	249,450
Soil conservation	7,030	5,490	3,323	59,900
Forest conservation	5,715	4,331	1,371	127,800
Fish and wildlife	13,904	8,421	6,347	57,730
Recreation	46,547	14,158	7,633	210,800
Salinity and sediment control	3	3	3	3
Pollution abatement and public health	4	21,477	9,101	472,500
Other beneficial purposes ⁵	—	—	—	—

NOTES: ¹ Primary tangible only; intangible and secondary tangible benefits and impacts considered are presented in narrative.

² Benefits assumed to be at least equal to the cost of the cheapest alternative and are assigned monetary values only for multiple-purpose developments for which benefits to water supplies total \$87,000.

³ Benefits and costs included in soil conservation, forest conservation, and flood control.

⁴ Justification based largely on intangible benefits, except for pollution abatement aspects of multiple-purpose projects for which benefits to pollution abatement total \$8,654,000.

⁵ Additional studies necessary for beach erosion control and hurricane protection but no regular program is included in the plan.

Flood Control and Prevention

The flood control program for the Apalachicola-Chattahoochee-Flint basins includes flood control storage in seven multiple-purpose reservoirs; flood protection as a part of upstream watershed developments; levee protection for eight cities; and a special flood control and industrial area development for the Columbus-Phenix City vicinity. These developments will alleviate flood problems in most major hazard areas of the basins but they will not completely eliminate flood damages. An improved system

of streamflow forecasting is recommended as a supplement to the physical control to be provided.

Water Supplies

The water supply program includes additional and improved supplies for domestic, municipal, and industrial uses. Water supplies will continue to be obtained principally from the ground water resource, except for the larger metropolitan areas. Storage for surface water supplies is included in the Muckalee dam and

TABLE 4.4
Flood Control Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs		
		Total	Operation, maintenance, and replacements	Invest- ment
Cedar Creek*	399	327	88	6,600
West Point*	747	644	40	16,700
Columbus-Phenix City	778	282	22	7,200
Spewrell Bluff*	667	583	45	14,950
Lazer Creek*	82	63	3	1,660
Lower Auchumpkee*	380	343	29	8,700
Muckalee*	45	39	6	900
Kinchafoonee*	80	70	19	1,400
Upstream watersheds*	2,500	1,242	309	24,800
Flood control levees	462	251	65	5,200
Total	6,140	3,844	626	88,110

* Flood control benefits and allocated costs only.

TABLE 4.5
Water Supplies Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs		
		Total	Operation, maintenance, and replace- ments	Invest- ment
Muckalee	87	72	18	1,500
Single-purpose water supplies				
Domestic	*	1,408	235	38,800
Municipal	*	23,740	16,890	322,800
Industrial	*	352	325	1,000
Total	*	25,572	17,468	364,100

* Not assigned monetary value.

reservoir project. The estimated demand for domestic, municipal, and industrial uses in the basins is over a billion gallons per day by year 2000.

In the lower parts of the basins ground water sources are generally the most likely source of water because of adequately yielding aquifers that are accessible at fairly shallow depths. In the Piedmont and Blue Ridge areas surface supplies will be required for high-volume users.

Adequate water supplies of good quality are essential to the health and well-being of all consumers and are an important asset for community and industrial development. Present availability does not, in reality, limit the value of water or the benefits from its use. The value of water to an area as a natural resource to be preserved for the future may be much greater than the cost of obtaining it under existing conditions of supply and demand.

Navigation

Navigation included in the plan includes extensions of both arms of the Apalachicola system. The extensions are justified by traffic that might be expected on the Flint River system by about 1980 and the Chattahoochee system by about 2000.

The Lower Flint project would extend a 9-foot channel from the present head of navigation at Bainbridge, Georgia, on Lake Seminole, to Albany, Georgia. The Middle Chattahoochee project would extend navigation from Walter F. George Reservoir at Columbus, Georgia, to metropolitan Atlanta.

Storage in reservoirs on the upper Flint River would provide downstream navigation benefits in the Apalachicola system by trapping sediment and helping to stabilize flows, thus reducing maintenance costs.

Proposed navigation facilities are based on transportation of large quantities of bulk commodities subject to movement by water and are analyzed on the basis of current practices, rates, and technologies for navigation and other types of transportation.

Reclamation, Irrigation, and Drainage

In this Appendix, reclamation and drainage are considered synonymous.

Irrigation

Irrigation will continue to be located principally in the Upper Coastal Plain portion of the basins. By year 2000, an estimated 17,800 additional acres of cropland are expected to be irrigated by individual systems on an individual farm basis. Principal crops to be irrigated are tobacco, cotton, truck crops, corn, and orchards. Sprinkler systems will be the main method of applying irrigation water. Individual farmers are expected to install irrigation systems with technical and financial assistance provided by State and Federal programs and private concerns. Irrigated acreages have been projected with the knowledge of current limitations imposed by ownership and land-use patterns, institutional factors such as crop allotments, and the expected time lapse before cropland uses

TABLE 4.6
Navigation Benefits and Costs¹
(thousands of dollars)

Project or program	Benefits	Costs		
		Annual equivalent	Annual equivalent	Invest-ment
	Total	Operation, maintenance, and replacements		
Middle Chattahoochee	² 9,173	9,296	899	233,500
Spewrell Bluff	34	27	3	700
Lazer Creek	9	6	1	140
Lower Auchumpkee	15	14	2	300
Lower Flint	² 1,442	1,632	265	37,850
Total	² 10,673	10,975	1,170	272,490

NOTES: ¹ Navigation benefits and allocated costs only.

² Intangible benefits deemed greater than difference between monetary benefits and costs.

TABLE 4.7
Irrigation Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs		
		Total	Annual equivalent Operation, maintenance, and replace- ments	Invest- ment
Individual projects	847	590	505	2,350

are determined more nearly by competitive economic conditions.

Irrigation provides insurance against drought conditions in some years, assists in prompt germination and continuous plant growth from seedlings to mature crops, assures a high survival percentage of transplanted crops, helps in establishing vegetative cover on eroded areas, and permits better use of land in accordance with capability.

Drainage

Use of land is restricted on a considerable acreage in the basins because of excess water. Within the assumed economic framework used for this study, it appears feasible to provide drainage for an estimated 39,000 acres of cropland, pastureland, and rangeland.

Upstream watershed projects proposed to be installed by year 2000 on nearly 1,900,000 acres of land include channel improvements which provide for drainage in combination with flood prevention.

Onfarm and small group facilities are expected to be used for most all agricultural land to be improved by installation of drainage fa-

cilities. Large group drainage is expected to be negligible. Surface facilities or open drains will be installed in most instances, but occasionally in the upper reaches of the basins, tile or closed drains may be installed. Individual farmers are expected to carry out nearly all the needed drainage improvements by using the detailed planning and technical assistance provided by Federal agencies through soil conservation districts.

Drainage provides for better use of land in accordance with its capability and also provides for improved land preparation, seeding, cultivation, management, and harvesting.

Woodland drainage is discussed under Forest Conservation and Utilization.

Hydroelectric Power and Industrial Development

Plans for the basins include the installation of nine new hydroelectric plants in conjunction with multiple-purpose reservoirs on the Chattahoochee and Flint Rivers. Four small existing plants with a total capacity of about 8,800 kilowatts would be replaced by the new facilities. The new installations would have a total in-

TABLE 4.8
Drainage Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs		
		Total	Annual equivalent Operation, maintenance, and replace- ments	Invest- ment
Individual projects	544	63	41	600
Upstream watersheds*	1,700	258	91	5,600
Total	2,244	321	132	6,200

* Drainage benefits and costs only.

stalled capacity of about 600,000 kilowatts and would produce about 1.2 billion kilowatt-hours of energy annually. Operation of the hydroelectric plants would be integrated with that for steam-generating facilities to provide a part of the peaking power needed in the systems.

Industrial development will play an important part in achieving the projected goals for the basins. Increased power production and other activities related to proposals in the resource development plan will add to the desirable environment for industrial development. Other factors which need consideration are the sources of raw materials, labor supply, education, financing, resource location in relation to cities, transportation, water supply, waste disposal, power requirements, and the impact of added population on public facilities.

The available resources should be given more thorough study to determine the possibilities for expansion of their use under going programs. The possibilities for expanding manufacturing activities which utilize quantities of local resources and available labor are particularly significant. Many small industries, with the help of local organizations, may be able to increase sales.

As the extensive recreational potential in the basins area is developed, industries associated

with boat building and repair, camping equipment, fishing gear, and similar enterprises will be needed.

In addition to the large agricultural, forestry, and recreational resources, the basins have commercial deposits of granite, limestone, and clay for use by processing plants to produce products needed by the expanding construction industry. Plants producing fertilizers, insecticides, and herbicides for use in expanding agricultural production and other chemical plants are potential industries for the basins area. Industries manufacturing container and packaging materials have a good market potential, particularly for food processing. Industries using wood products and lumber also have a good potential for expansion. Assembly plants and fabricating shops of all types are expected to continue to increase in the transportation and distribution centers.

No attempt has been made to identify or locate specific enterprises that are expected to come into the Apalachicola-Chattahoochee-Flint basins, but a significant part of the plan is directed toward establishing a general setting that will be attractive to new or expanding industrial plants. The only development proposed specifically for industrial use is the Columbus-Phenix City project, discussed in Section V.

TABLE 4.9
Hydroelectric Power Benefits and Costs¹
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs			Invest- ment	
		Annual equivalent		Taxes fore- gone		
		Total	Operation, maintenance, and replace- ments			
Cedar Creek	1,364	1,251	189	385	18,600	
Atlanta Pollution Abatement	285	269	88	77	3,900	
West Point	2,167	2,019	239	554	34,000	
Middle Chattahoochee ²	4,100	4,234	647	1,100	69,200	
Spewell Bluff	2,669	2,490	291	770	39,700	
Lazer Creek	2,338	2,014	241	670	30,500	
Lower Auchumpkee	2,203	2,110	260	624	33,900	
Lower Flint	1,098	1,098	172	216	19,650	
Total	16,224	15,485	2,127	4,396	249,450	

NOTES: ¹ Hydroelectric power benefits and allocated costs only.

² Intangible benefits deemed greater than difference between monetary benefits and costs.

Soil Conservation and Utilization

Application of soil conservation measures and practices on cropland, pastureland, and rangeland needing conservation treatment throughout the basins is a basic principle in protecting the soil resources and in providing sustained agricultural production in the basins and region. In much of the basins, application of soil conservation measures and practices provides the most effective means of watershed protection. Applying these practices and measures will be accomplished by individual farmers on an individual farm basis. It is estimated that, by year 2000, about 1,690,000 acres will be treated by the application of annual and permanent soil conservation measures and practices to protect the soil on the cropland, pastureland, and rangeland and to protect the cover on the pastureland and rangeland.

In addition to protecting the soil, application of these practices and measures will reduce the sediment load and thus extend the life of floodwater retarding structures and major reservoirs and enhance the value of the streams and reservoirs for fishing and recreation.

About 15,000 additional farm ponds will be installed to provide for livestock water, irrigation water supply, small impoundment fishing, and some unclassified recreation use.

Forest Conservation and Utilization

The program for forest conservation and utilization includes fire protection, fencing for woodland grazing control, erosion control tree planting, woodland water control and forest roads, planting shelterbelts, timber-stand improvement, other tree planting, site preparation for natural reproduction, and improved woodland management. All 8,169,000 acres of forested areas in the basins are included.

The forestry program will be largely developed, financed, and administered by timber owners with technical assistance from Federal agencies and some Federal participation in fire prevention and other aspects of the program.

Fish and Wildlife

The fish and wildlife program is primarily one for local and State development but some Federal assistance would be provided under existing law. The overall program includes both single-purpose activities and fish and wildlife features in multiple-purpose projects. The hunting program will provide for 2,294,000 user-days annually by the year 2000. The 1960-2000 developments will provide 1,268,000 user-days, including 47,000 provided to offset losses created by the multiple-purpose reservoirs. The fishing

TABLE 4.10
Soil Conservation and Utilization Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs		
		Total	Annual equivalent Operation, maintenance, and replace- ments	Invest- ment
Basinwide	7,030	5,490	3,823	59,900

TABLE 4.11
Forest Conservation and Utilization Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs		
		Total	Annual equivalent Operation, maintenance, and replace- ments	Invest- ment
Basinwide	5,715	4,331	1,371	127,800

TABLE 4.12
Fish and Wildlife Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equivalent	Costs		
		Total	Annual equivalent Operation, maintenance, and replacements	Investment
Highlands ¹	—	—	—	—
Cedar Creek ²	99	69	11	1,600
Dog River ²	56	45	8	1,000
Anneewakee ²	213	197	63	3,700
West Point ²	130	109	14	2,600
Middle Chattahoochee ^{2 3}	42	50	12	1,070
Omussee ²	15	13	3	280
Spewrell Bluff ²	100	86	12	2,050
Lazer Creek ²	59	38	5	900
Lower Auchumpkee ²	80	72	11	1,700
Lower Flint ²	161	161	26	3,750
Muckalee ²	8	8	1	200
Kinchafoonee ²	6	5	1	100
Chipola ²	33	9	8	500
Apalachicola Bay	1,307	787	766	430
Water-access areas ²	155	152	77	2,050
Single-purpose programs				
Sport fisheries and wildlife	10,550	5,848	4,566	35,560
Commercial fisheries	890	772	763	240
Total	13,904	8,421	6,347	57,730

NOTES: ¹The project would be located in these basins and in the Savannah basin. Total benefits and allocated costs are shown in Appendix 1, Savannah Basin.

²Fish and wildlife benefits and allocated costs only.

³Intangible benefits deemed greater than the difference between monetary benefits and costs.

program will provide, by the year 2000, 8,961,000 user-days. The developments provided between 1960 and 2000, and summarized above, will provide for a net increase of 6,927,000 user-days.

The commercial fisheries program would consist of expansion of existing operations; cultivation of shrimp, oysters, pompano, and other high-quality seafoods; and acceleration and expansion of existing facilities and going programs.

Recreation

The proposed and existing facilities included in the plan would provide for a projected annual need of 58 million user-days of public outdoor recreation, exclusive of hunting and fishing, by the year 2000. Development of existing and new facilities would accommodate about 29,980,000 user-days at major impoundments and 28,020,000 user-days at beaches, general outdoor areas, natural environment areas, and cultural areas.

Projects and programs for recreation development during the period 1960-2000 would provide for 44,865,000 user-days—12,785,000 user-days with expanded facilities at developments existing in 1960 and 32,080,000 user-days at new areas. The projects and programs are summarized in Table 4.13.

Salinity and Sediment Control

Neither salinity nor sediment are major problems in the Apalachicola-Chattahoochee-Flint basins and no projects or programs are proposed exclusively for their control. Saline soils in the basins are located almost entirely in the coastal marshes. There is no foreseeable need for conversion of saline land to agricultural uses before year 2000. Incidental sediment and salinity control values will probably result from other functional programs and multiple-purpose projects but the benefits have not been evaluated separately.

TABLE 4.13
Recreation Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs			Invest- ment
		Total	Annual equivalent Operation, maintenance, and replacements		
Highlands ¹					
Cedar Creek ²	5,871	1,824	719		33,200
Anneewakee ²	3,677	1,019	606		13,800
West Point ²	748	188	105		2,500
Middle Chattahoochee ²	875	320	142		4,930
Omussee ²	156	108	37		1,970
Spewrell Bluff ²	1,322	519	173		10,100
Lazer Creek ²	1,322	583	179		11,700
Lower Auchumpkee ²	555	280	80		5,600
Lower Flint ²	465	295	94		5,550
Muckalee ²	156	62	32		800
Chipola ²	755	233	141		2,600
Water-access areas ²	7,705	1,807	1,158		17,950
Single-purpose recreation	23,440	6,920	4,167		100,100
Total	46,547	14,158	7,633		210,800

NOTES: ¹ The project would be located in these basins and in the Savannah basin. Total benefits and allocated costs are shown in Appendix 1, Savannah Basin.

² Recreation benefits and allocated costs only.

Pollution Abatement and Public Health

Pollution abatement values are largely derived from direct action by individuals, municipalities, counties, and industries. Pollution abatement, however, is a purpose at two of the proposed multiple-purpose projects. The water to be stored in the Dog River project will not be used directly for dilution of wastes but is provided as replacement for water that is diverted

from the Chattahoochee basin to the Altamaha basin via the sewerage systems of the cities of metropolitan Atlanta. The Atlanta Pollution Abatement project will collect effluents from the metropolitan area treatment plants that are located in the Chattahoochee basin and carry the wastes to the Chattahoochee River at a point below the proposed Cedar Creek dam. Air or oxygen entrained in the pipe system will provide some degree of treatment and the discharges

TABLE 4.14
Pollution Abatement and Public Health Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs			Invest- ment
		Total	Annual equivalent Operation, maintenance, and replacements		
Pollution abatement	¹	12,000	2,300		395,200
Public health	¹	5,230	5,000		9,400
Dog River	² 279	174	28		4,000
Atlanta Pollution Abatement	² 8,375	4,073	1,773		63,900
Total	8,654	21,477	9,101		472,500

NOTES: ¹ Benefits assumed at least equal to costs, but no assigned dollar values.

² Monetary benefits for pollution abatement resulting from dilution water provided by multiple-purpose developments are assumed to equal the average cost of tertiary treatment to provide similar stream water quality.

from the Cedar Creek powerplant will provide adequate dilution for the waste discharges.

The value of the pollution abatement is based on the cost of providing the same quality of effluent by constructing tertiary treatment plants designed for the 7-day low flow that would occur once in 10 years if the storage water was not available.

The public health program consists of drainage and spraying for vector control, incinerators for solid-waste disposal, sanitary landfill for fly and rodent control, and continuation of state-wide programs for air pollution and radiological monitoring. The health aspects of other projects and programs relate to the prevention of additional hazards to health and these costs are, therefore, included in the other purpose costs. These pollution abatement and public health programs are expected to contribute to the general health and welfare of residents, tourists, and vacationists, including fishermen and hunters.

Other Beneficial Purposes

Beach Erosion Control and Hurricane Protection

Beach erosion problems occur along much of the basins coast. Hurricane damage has not been too severe in the past because development is lacking in the areas of prevailing hurricane paths. Both erosion and hurricane damages will increase as coastal areas continue to be developed. Proposals for alleviating these problems require detailed analyses considered to be beyond the scope of this study, however, a cooperative survey should be made of the influences of tides, offshore currents, hazards from hurricanes, winds, and places of immediate danger. In this connection, use should be made of the results of Corps of Engineers studies which cover most of the hurricane protection problems in the study area.

The existing hurricane warning systems should be modified as required to serve the area better. Evacuation routes should be established over

bridges and causeways, and a plan for using existing ferries and other boats for emergencies should be prepared for use of St. George Island and for other out-of-the-way places as the need develops.

Provision should be made for installing and enforcing zoning and building codes, auxiliary power supplies, and determining the needs for protective seawalls or similar structures.

Beach erosion control plans should be coordinated with plans for channel improvement and maintenance, hurricane protection, recreation, fish and wildlife proposals, and other proposed improvements in the area.

Other Purposes

There are no development features in the plan specifically for purposes other than those listed above. The plan provides for continuing programs for obtaining topographic and geologic mapping, hydrologic data, data on water quality and water use, and on land-use changes to improve and add to the store of basic data on the area resources.

The forecasting of streamflow is essential in the proper management of water resources. Flood forecasting is well known for reservoir operation and for warnings in areas unprotected by physical control of floodwaters. Future use and regulation of streams will require forecasts of flow, both high or low, as far in advance as is practicable. All river-related purposes such as recreational boating, fishing, navigation, hydropower operation, water supply, pollution abatement, public health, irrigation, and flood control are benefited by advance information as to the expected flows. The costs of forecasting are relatively small and are included in the overall project and program costs. The benefits are also included, in effect, since it was assumed that the best possible forecasts would be available. These benefits are not achieved automatically. A deliberate program which recognizes the necessary lead time for development of a reporting network and other facilities is required.

SECTION III – IMPACTS OF THE PLAN

Economic

A major objective of the plan is to improve the environment of the basins for people. These

improvements are not all measurable in tangible terms. Identifiable primary tangible benefits have been used for evaluation of the projects

and programs in this plan. It is recognized, however, that many values stem from benefits not identified or given full recognition in the monetary justification. These nonevaluated benefits may be either or both primary and secondary in nature.

The impact of programs and projects which involve increased production of commodities would be felt in the general community by requiring additional production materials and processing equipment and more services to provide the material, maintain the equipment, and sustain its operation. These increased activities would stimulate a substantial exchange of money throughout the basins. Similarly, it is expected that there will be very sizable impacts from recreation and sport fishing and wildlife projects and programs. Fishing camps, motels, sporting goods stores, service stations, boat dealers, restaurants, and related new businesses would be required.

Development of the water and land resources in the Apalachicola-Chattahoochee-Flint basins could also stimulate economic development that would reach beyond the basins limits. Inasmuch as most of the financing and cost sharing of the proposed developments, as well as the initiative for development, must be borne by local interests, it is important that impacts of the comprehensive plan be recognized and understood.

Flood Control

With annual damages from floods exceeding \$3.4 million, flood control is of great importance to the basins. The projects proposed for that purpose would protect the lower valley areas that have been flooding in the past. Upstream watershed programs, including the small reservoirs and farm ponds, would also improve the situation downstream. Greater safety from floods would make the entire area more attractive to widespread economic expansion of business and manufacturing and permit more intensive use of land for agricultural purposes.

Water Supplies

Water availability governs all human activity. Abundant supplies of water often set the stage for rapid economic development. One should not let the present availability diminish the value of water and its benefits. The availability of good quality water in ample supplies deter-

mines to a considerable extent the character and degree of community and industrial development. Availability of water can start or continue an expansion that will result in great economic benefits to any locality. Therefore, in reality, the value of water to an area as a natural resource to be preserved for the future should be considered as much greater than the cost of obtaining it today.

Navigation

The economic impacts of navigation projects would stem from the primary benefits of savings in transportation costs to (1) existing traffic not now using the facilities and (2) potential traffic expected to develop because of the waterway. These benefits may give rise to economic development of economic impacts.

Industries that supply or consume large amounts of bulk commodities suitable for water transport generally find it advantageous and profitable to locate on navigable inland waterways. These improved waterways become parts of mass-production lines for moving bulk materials and component parts or finished commodities at low cost. If other factors such as raw materials, markets, land transportation, power, and suitable sites are favorable, industrial development could very well be an outgrowth of navigation improvements.

Industries that utilize or produce agricultural products, steel or iron, coal, petroleum, chemicals, pulp and paper, building materials, transportation equipment, and farm machinery are the big users of navigable waterways. These industries have been responsible for billions of dollars of industrial development on navigable waterways since World War II. An expansion of the petrochemical industry on the Gulf Intracoastal Waterway is evidence of the attractiveness of navigable waterways to industrial development. It is in this subsequent development that the real economic impacts are found.

Certain economic impacts which are not computed when evaluating a project would stem from a navigation project. The extension of the Chattahoochee Waterway to Atlanta, for instance, would assist in the continued growth of Atlanta as a major industrial and distribution center. The extension of the Flint Waterway to Albany would have a considerable effect on the economy of that city. Some commodities for-

merly not transported by waterway could be shipped more economically by this form of transportation.

Irrigation, Drainage, Flood Prevention, and Soil Conservation and Utilization

In the past, agriculture has been a major segment of the economy of the Apalachicola-Chattahoochee-Flint basins. In 1960, agricultural employment actually exceeded manufacturing employment only in the Florida portion of the basins. Agriculture is expected to continue to decline in importance insofar as onfarm employment is concerned, yet agricultural production is expected to increase. As a source of raw materials to sustain the food processing industries, agriculture should continue to be important. Secondary benefits should generate much new business activity and improvement in the basins.

The best measure of the impact of the total agricultural program is the net incomes and production expenditures. In 1960, the net income of the total agricultural program in the basins was \$31.3 million. By 2000, it should be \$150.9 million. It has been estimated that, for every dollar of net income derived from primary industries, including agriculture and forestry, there is at least an additional \$1.25 to \$1.50 income generated to the local economy.

Production expenditures also are expected to increase. By 2000, the basins farmers will spend about \$126 million for feed, \$40 million for livestock, \$11.7 million for seed, \$56.6 million for fertilizer and lime, \$56.6 million for repairs, \$65 million for labor, \$8.7 million for taxes, \$5.7 million for interest, and so on for total production expenditures of \$464.8 million.

Only a portion of the total agricultural program involving soil conservation and utilization, reclamation, drainage, irrigation, and upstream watershed improvements is included in the basins plan.

The benefits, primary and secondary, from these programs will create a portion of the economic impacts of the total agricultural program. They, like the impacts from other aspects of the agricultural program, will have real and lasting effects on the basins communities. Benefits will accrue through improved efficiencies of farm operations; reduction of turbidity of many streams; prolongation of the useful life of sur-

face reservoirs; some alleviation of flood and sediment damage to roads, bridges, roadfills, livestock, and real and personal property; improved wildlife habitat and recreational facilities; and abatement of stream pollution. They also facilitate proper utilization of agricultural lands by protecting lands from erosion, permitting more intensive utilization, and contribute toward adequate agricultural and nonagricultural water supplies for the people of the basins.

Hydroelectric Power and Industrial Development

There are several hydroelectric power projects proposed for installation in the basins. Private power companies will construct additional electrical facilities including steampowered electric plants as the demand dictates. The assured cooling water supply provided by the proposed water control system may result in some of these plants being constructed in the basins.

Manufacturing employment projections for the basins show an increase in all industrial categories by 2000 except textiles. Industries that show promise of greatest increase are oriented to either market, resources, or labor availability. The food processing industries are one of the largest activities and the impact of these industries is felt in the basins particularly in the Piedmont area. The lumber and wood products industries are also of importance and their impact is basinwide.

Industrial expansion in the Piedmont area of the Chattahoochee River, and more particularly around Columbus and Atlanta, points out the impact of industrial development. Capital expenditures are made for plants and facilities, most of which are spent locally. Manufacturing employee payrolls also make a significant impact on the community. Additional nonagricultural-nonmanufacturing jobs soon result and add more economic benefits from manufacturing enterprises.

Capital expenditures for industrial expansion anticipated in the basins are expected to average about \$72.5 million annually. An annual average of 5,700 new jobs should be created in manufacturing and approximately 18,000 new jobs annually are expected in service, trades, and professional categories. Much of this growth will continue to concentrate in the metropolitan Atlanta area.

New manufacturing employees and those in

supporting industries and trades will buy new homes, cars, furniture, appliances, food, drugs, and services. They will also pay taxes and demand governmental services for their tax dollar. So with economic progress comes community demands for services. This means demand for highways, water and sewerage facilities, education, and police and fire protection. Communities that keep abreast or even ahead of these demands are the communities that are going to realize the fastest growth.

The economic impact of industry does not stop when it reaches the city limits or even the basins boundaries. Its effects are far reaching.

Forest Conservation and Utilization

Nearly 66 percent of the Apalachicola-Chattahoochee-Flint basins is in woodlands of which over 78 percent is in small private holdings. Timber production in the basins should be doubled by 2000 and a large share of this increase is expected to be achieved on small holdings.

This increased production is of great importance to the basins because of the raw materials needed to advance the manufacturing potential. The pulp and paper industries as well as the lumber and wood products industries hold promise for employment growth. Increased employment will be forthcoming from reforestation, management, and fire protection. More employees are also expected to be needed for harvesting and transporting of the timber products and raw materials. All of these activities can be of great importance to the smaller rural communities. They mean increased expenditures for equipment, supplies, taxes, services, payrolls, and housing.

In addition, the forestry program would improve the condition of the soil and reduce erosion and storm runoff. Recreation possibilities would be enhanced, and better fish and wildlife habitat would be provided.

Fish and Wildlife

The expenditures of sportsmen in the project areas would add much to the economy of the basins. Additional employment opportunity would be afforded by many small businesses engaged in boat building and supplies, operation of fishing and hunting camps, and in services and sales of food, gasoline, arms and ammuni-

tion, fishing tackle, live bait, and other sporting goods and supplies.

Table 4.15 summarizes some of the percentages of expenditures which might be expected from hunting and fishing in the basins. These are compiled from national averages and are only illustrative. The rate of expenditure varies widely from a few cents per day for the local hunter and fisherman to more than \$100 per day in some instances for the vacationing sportsman. National averages approximate \$6 per day.

TABLE 4.15
Percentage Distribution of Expenditures
Hunting and Fishing—1960

Expenditure item	Hunting	Fishing
Food	7	8
Lodging	2	2
Transportation	15	14
Equipment	49	48
License, tags, permits	5	2
Leases, fees, other	22	26
Total	100	100

Benefits that are less tangible are derived from general enhancement of the recreational opportunities afforded by a given locality. The growth of many towns and cities in this portion of the Southeast will depend to a great extent on their attractiveness and proximity to lands and waters affording good hunting and fishing.

The commercial fishing industry generally is plagued by the vagaries of weather, seasonal fluctuation of supply, precarious market conditions, and lack of good conservation practices. As a result, this industry is not attracting energetic young men. The benefits which could be realized, however, are of such magnitude as to justify a vigorous effort toward attracting new men into the industry.

Secondary benefits include increased employment in the fishing and seafood industries and in boat building, boat maintenance, and boat-supply enterprises. More services would be required; and sales of food, gasoline and oil, fishing supplies, and other equipment would increase.

Recreation

Outdoor recreation activities contribute to economic stability in many areas of the Nation, including several areas in the Apalachicola-

Chattahoochee-Flint basins. Various trades and services and several segments of industry, such as boat building and recreation equipment, that are partially or wholly dependent upon outdoor recreation pursuits have evidenced phenomenal growth in the Nation in the last decade. As leisure time and per capita income increase, this growth is expected to continue.

Outdoor recreation produces many benefits, some of which are not easily expressed in monetary terms. Recreation provides the healthful exercise necessary for physical fitness. It promotes mental health and offers esthetic values.

Secondary benefits produced by recreational activities are reflected in the economy of the area, the community, and the Nation. Some of these secondary benefits are: Stimulation of travel and travel expenditures; development of business activity in areas within, adjacent to, or enroute to recreation areas, increasing retail trade and new construction; stimulation of business activity relative to the manufacture of recreation equipment; increased property valuations in and around recreation areas; and increased miscellaneous net tax revenue after deducting increased governmental expenditures for needed governmental services.

Surveys have been made in many areas but the effectiveness of these surveys is dependent upon how they were developed and for what purpose. Some of the surveys give individual expenditures estimates running from \$4 to \$7 per day and breakdowns of expenditures for food, lodging, and transportation. A recent Georgia survey determined that about \$4 are spent daily by the recreationist. These expenditures are reflected in the economic activities mentioned above. Even if this rate does not increase in the next 40 years, the 58 million recreationists expected to use the Apalachicola-Chattahoochee-Flint basins annually by 2000 would be spending over \$232 million, or about half as much as the total agricultural expenditures.

Water-based recreation is of special importance to outdoor recreation. Reservoirs, lakes, unpolluted streams, and gulf and ocean beaches generate more recreational activity than any other recreation factor. A recent 10-year study of selected counties in the Arkansas-White-Red River Basins with significant reservoir shorelines showed an increase in per capita income of

57 percent, an increase in bank deposits of 57 percent, and an increase in tax levies of 64 percent. Also significant was an increase in investment in overnight lodging facilities, annual expenditure on private home construction, and new school construction. Counties in the same areas without shorelines fell far short of this rate of growth.

While all of the economic gains in those reservoir counties cannot be directly attributed to the presence of new lakes, it cannot be overlooked that the new recreational activities had a pronounced effect. The reservoir counties are better off by nearly all economic yardsticks. However, it should be pointed out, also, that these counties were comparatively depressed prior to the construction of the reservoirs. The impact of the recreation dollar was more dramatic in this situation than it would be in an area of greater economic activity.

Pollution Abatement and Public Health

Clean surface water enhances the well-being of people and is a factor which influences people as to their choice of place of residence, employment, and recreation. Thus, this is important in sustaining a healthy environment and in attracting others to the basins.

Pollution abatement is frequently necessary to realize fishing, hunting, and recreational opportunities. In turn, clean streams improve land and property values which have a great impact on economic development. Industries are particularly interested in establishing new plants in areas where pollution problems can be handled effectively and where provisions have been made for orderly expansion of public facilities needed for pollution abatement.

There are varying degrees of pollution in the streams of the Apalachicola-Chattahoochee-Flint basins. The pollution is primarily from municipal wastes and industrial wastes. To treat properly these wastes will require over \$147 million in treatment systems and sewer lines by 1975. Construction of these facilities is expected to provide employment in 105 or more communities in the basins. Other expenditures of over \$300 million will be required between 1975 and 2000 to keep abreast of the population growth in the municipalities.

In these basins, where recreation is so important to the future economic development,

water quality assumes greater than normal importance. Pollution abatement would constitute insurance for future usefulness as well as for immediate purposes.

Pollution abatement in the Florida portion of the Apalachicola River basin would improve commercial fishing and oyster production in the Apalachicola Bay area. The oyster production program, including pollution abatement, would by itself result in over \$1 million annual increase to the Apalachicola area. This is an increase of more than five times the current annual production and would have a pronounced effect on the local economy. There would be increased employment in harvesting, processing, and marketing of the catch as well as increasing the need for equipment servicing and maintenance.

Pollution abatement and water quality control programs for metropolitan Atlanta and the Columbus-Phenix City-Fort Benning area would maintain water quality for necessary uses and further enhance the growth of these two complexes. The problems now being created by industrial and domestic waste discharges will become more serious in future years, unless planning and coordination of governmental subdivisions are undertaken now. Their solution now could assure continued growth of these two areas as well as the downstream areas.

Public health programs for control of vectors, mainly mosquitoes and gnats, are also very important. The coastal areas of the Apalachicola-Chattahoochee-Flint basins with their tidal marshlands, as well as the entire length of the basins with their numerous ponds and depressions, afford breeding places for mosquitoes and other vectors. Various agricultural practices such as raising hogs and chickens may breed flies, if not properly carried out. Much of this can be eliminated by better drainage and better sanitary conditions. Control of these undesirable vectors could mean the difference in some places between success or failure in the efforts to improve the area economy.

Other Economic Impacts

Besides the impacts of the functional programs, other noteworthy economic impacts relate to several or all of the functional programs.

Land enhancement impacts—Land and water

resources improvements have not been planned specifically for enhancement of land. However, the land enhancement benefits that would result from reservoir construction and certain other projects would be considerable. Waterfront property, particularly that suitable for homesites and recreational and industrial development, is generally marketable at a higher value than non-waterfront property with all other factors being equal. Land that was previously woodland is subdivided into more expensive lots. Other areas become important for industrial property because of stable, ample, and unpolluted water supplies. Many public costs, however, are associated with rising land values, so that the entire amount of these values cannot be looked upon as net benefits.

Rapid development of lakeshore property for recreation and commercial use has followed reservoir development throughout the Southeast River Basins area. This development, with resultant increase in property values, has naturally been greater and more rapid in those areas located near major population centers. Reconnaissance studies in the Lake Sidney Lanier area suggest that property values in the vicinity of reservoirs used extensively for recreation have increased tenfold during the first 10 to 12 years of development.

This is not to claim that all land enhancement values or projects outlined in the comprehensive plan will be of the same magnitude. Several factors influence land enhancement and are listed as follows:

- (1) Proximity to urban population,
- (2) shoreline topography,
- (3) fluctuation in water level,
- (4) water quality,
- (5) accessibility and shoreline ownership, and
- (6) size of water body.

In the future, as waterfront property becomes more scarce as a result of increases in population and leisure time, the enhancement of land will be an even greater secondary effect of water project development.

Impact from tax revenues—Increased tax revenues usually come as a result of increased economic activity, increased land and resource productivity, more intensive land use, and more real property. Counties that today have a uniform or declining economic activity, low level forest and farm productivity, poor land use, and

little new construction are not in a favorable position to realize greater tax revenues. Even tax equalization is difficult under such a situation. Without sufficient tax revenues, government efficiency and extension of community services are almost impossible.

Development of projects and programs envisioned in the comprehensive plan will do much toward alleviating this situation. Increased economic activity will follow as a result of the implementation of the projects and programs. The forestry program will result in increased forest productivity. The soil conservation, reclamation, irrigation, and drainage programs will mean increased farm productivity. Increased economic activity will result in more residential and business construction. All of these effects coupled with judicious tax equalization, mapping and platting, and governmental administration will mean increased tax revenues and better governmental services.

Inundated reservoir lands and lands taken out of production for other projects and purposes may create a loss in taxable property to the county tax rolls. However, these tax revenue losses do not necessarily have to be permanent. In the case of reservoir lands, proper development and management of the shoreline area and the resulting land enhancement and new construction will practically always soon outweigh the losses. In the previously mentioned study of selected counties following reservoir construction in an underdeveloped area in the Arkansas-White-Red River Basins, it was found that tax revenues were up 64 percent at the end of 10 years. Revenues in nearby counties without reservoirs increased less than 4 percent. This study also pointed out that the 10-year average annual revenues paid to the counties in lieu of taxes far exceeded the first year tax loss from inundated property. In some cases, this average annual revenue amounted to over 10 times the first year tax loss. On the whole, the average annual revenue was a gain of over 320 percent above the first year tax loss. This revenue is not included in the 64-percent increase in taxes levied mentioned above.

Impacts from construction activities—The construction of storage works and other facilities will provide an economic stimulus to the local area during the construction period. This is brought about by the temporary influx of

workers for the project who desire housing, food, services, and entertainment and by the fuller employment and higher payment to workers from the local labor force. Most of this economic activity, stemming from wages and salaries, is felt locally.

It has been estimated that about 60 percent of the total construction cost is labor cost. Whether or not this would be spent mostly locally would vary with the individual projects and their proximity to urbanized areas. The remaining 40 percent is for materials, equipment, maintenance, service, etc., and most of these costs would affect a larger area—even the national economy, being less impressive to any individual locality. It should be remembered that the community is subject to substantial cost as a result of increased population engaged in construction, and this cost must be considered in appraising the benefits.

Impacts from migration—A high birth rate, a relatively dense population for an agricultural area, and limited employment opportunities have produced in the Southeast River Basins an extremely mobile population. This out-migration and regional urbanization have been good, in many respects, as safety valves which have prevented population pressures from reaching even more undesirable proportions in the rural areas. Migration since the 1930's has also brought about a loss to the area, however, because these out-migrants represent lost manpower and lost expenditures to the area for the rearing, educating, and training of the migrants.

At the same time, the Southeast River Basins area has evidenced a growing amount of immigration. Generally, the amount of education, training, and income represented on a per capita basis by this group has been relatively higher than that for the out-migrants. As a result, the economic losses from out-migration have been tempered a little by the economic gains from immigration.

A migration study was prepared for the Southeast River Basins area as a whole. The results of that study did not provide specific data to show the economic effect of migration on the Apalachicola-Chattahoochee-Flint basins. However, the trends indicated by the study are assumed to be applicable to the basins.

The study shows that during the period 1960-75 out-migrants should continue to outnumber

in-migrants but not to the extent which was evident from 1930-60. Because the in-migrants are expected to be better educated and skilled than the out-migrants, the area should evidence a modest gain when comparisons are made of the cost of rearing, training, and educating the migrants. During the period of 1975-2000, this economic gain should be even greater because the in-migrants should then begin to outnumber the out-migrants.

Another comparison was made of the personal income of the migrants and anticipated migrants. Under this comparison, the period of 1960-75 should show an economic loss but certainly not nearly as great as that evident during the 1930-60 period. However, during the period 1975-2000, the area should start to gain economically in this comparison of personal income.

Impacts to redevelopment areas—Of the 77 counties falling wholly or partially in the Apalachicola-Chattahoochee-Flint basins, 38 had been designated redevelopment areas as of April 20, 1962, under Sections 5 (a) and (b) of the Area Redevelopment Act of 1961. These were so designated because of low median family income, low farm family income, and persistent and substantial unemployment.

Some of the projects and programs proposed for the basins should help remedy these conditions. For instance, the food and fiber program will improve farm and forest production and income throughout the basins, increasing per capita income, especially for farm families. The commercial fisheries program will increase fish production and assist in increasing employment in the coastal counties. The projects to provide more and better recreational areas will increase per capita income, as well as provide additional employment in the vicinity of the individual projects. Many of the projects will create sizable temporary employment during the actual construction phase.

Assistance is available to these counties under the provisions of the Area Redevelopment Act. This assistance is in the form of loans for industrial and commercial projects, loans and grants for public facilities, technical assistance, occupational training, and retraining subsistence payments.

Physical

The water-storage projects included in the plan will provide sustained flows downstream from storage works, thus improving annual low-flow periods and eliminating periods of extremely low flow. The changes, however, are not of such magnitude as to change the basic stream regimens. The precise timing of flood peaks and their concentrations have not been studied in detail, however, some floodwater will be stored for later use and flood durations and peaks will be decreased in many areas.

The storage at Buford Dam provides the basic stream control essential to the development of hydroelectric power at the Cedar Creek, Franklin, and West Point damsites. There would be downstream benefits due to the increased generation made possible at downstream plants by the regulation of the Chattahoochee River flows at the West Point project. The plants which would be benefited are the Georgia Power Company's Bartletts Ferry, Goat Rock, Oliver, and North Highland projects and the federally owned Walter F. George and Jim Woodruff projects. Energy production would not be materially changed at the Langdale, Riverview, and other smaller projects.

The regulation of the Flint River flows by the Spewell Bluff, Lazer Creek, and Lower Auchumpkee Creek projects provides the basic stream control essential to the Lower Vada hydroelectric development and would benefit the existing Crisp County and Georgia Power Company plants and the Jim Woodruff project.

Very little consumptive use of water is planned, so average annual discharges from streams will not change materially. Increased ground water pumping, in excess of consumptive use, will probably provide a small increase in flows. Evaporation losses from reservoir water surfaces are expected to offset transpiration and evaporation losses from the areas proposed to be inundated.

The effects of drainage, land management, urbanization, road construction, and other cultural improvements will affect runoff patterns in some localities. The aggregate of these effects, however, will tend to compensate and is expected to have little total effect on flows of major streams.

Surface water quality should be improved in areas where flows are stabilized and should not be impaired in other areas if the proposed treatment facilities and rural zoning regulations are provided. However, head-to-toe storage systems on the Chattahoochee and Flint Rivers will create new assimilation conditions and portions of potential pollution problems will need to be considered carefully.

Salt water has already caused minor problems by intruding into fresh-water supplies at coastal developments. This problem is not expected to become widespread but extensive and uncon-

trolled demands on ground water supplies as coastal communities continue to develop may cause serious problems in specific localities.

The productive capacity of the land in the basins will not be reached during the 1960-2000 period, so changes in land use should not create significant problems beyond the local area immediately affected.

The types of developments that are proposed are limited to those that will not impair the esthetic beauty of the basins. The reservoirs and other facilities should complement the areas natural attractions.

SECTION IV - PLAN IMPLEMENTATION

Cost Sharing

Resource development costs should be shared so as best to serve the public interest by: (1) Encouraging sound resource development and economic and social stability and growth; (2) promoting maximum efficiency in use of private and public funds; (3) obtaining an equitable relationship between the incidence of costs and benefits; (4) preventing avoidable wastes, unwarranted windfall gains, and undesirable competition; (5) serving as a check on project desirability and encouraging desirable types and sizes of enterprises; (6) securing consistency between the various purposes of resource development; and (7) promoting public understanding and cooperation in resource development.

Two types of costs are used for cost-sharing analyses: (1) Investment costs, which include all of the costs of project construction including lands and rights-of-way, estimated for the period of full development of the project; and (2) operation, maintenance, and replacements costs, shown as an annual cost, and estimated on the basis of development at the year 2000. These costs are divided into those expected to be borne by the Federal Government and those to be borne by non-Federal interests. Before final cost-sharing arrangements are made, the non-Federal portion will often need to be further subdivided among State, local, and private participants. This subdivision is not important in project evaluation and is a detail beyond the scope of this study.

Of the total investment costs of the plan, about 28 percent is estimated to be borne by

the Federal Government and about 72 percent by non-Federal interests. For operation, maintenance, and replacements costs, nearly 95 percent is expected to become the responsibility of the non-Federal groups involved in land and water developments.

Pollution abatement investment costs, accounting for about 25 percent of the total, represent the largest expenditure for any single purpose. Water supply is second in order of magnitude of investment with about 20 percent of the total. Hydroelectric power and navigation each amounts to slightly less than 15 percent. Agriculture, including forestry, accounts for slightly over 11 percent. Recreation, which is the largest program in some basins, accounts for only about 11 percent of the total investment in the Apalachicola-Chattahoochee-Flint basins.

Operation, maintenance, and replacements costs for use in cost-sharing determinations are based on full use of the facilities that are specifically proposed. Since the ultimate need during the period studied will not normally develop until the year 2000, the full operation, maintenance, and replacements costs for the facilities included in the plan are shown as operation, maintenance, and replacements at year 2000. The comprehensive plan is designed to meet needs to the year 2000, so additional needs, costs, and benefits that may develop after that year have not been evaluated. This does not ignore or preclude the possibility of adding facilities after the year 2000 to the then existing projects and programs to meet additional needs.

Cost-sharing data shown on Table 4.16 are

TABLE 4.16
Cost Sharing—Comprehensive Plan

Purpose or project	Investment costs				Annual operation, maintenance, and replacements costs at year 2000			
	Total (\$1,000)	Federal (\$1,000)	Non-Federal (\$1,000)	(pct.)	Total (\$1,000)	Federal (\$1,000)	Non-Federal (\$1,000)	(pct.)
Purpose¹								
Flood control	88,110	57,565	65	30,545	35	627	154	25
Water supplies	364,100	--	0	364,100	100	33,548	--	0
Navigation	272,490	217,995	80	54,495	20	1,172	1,114	95
Irrigation	2,350	588	25	1,762	75	378	--	0
Drainage	6,200	1,550	25	4,650	75	121	--	0
Hydroelectric power	249,450	--	0	249,450	100	2,127	--	0
Soil conservation	59,900	17,970	30	41,930	70	3,323	--	0
Forest conservation	127,800	44,730	35	83,070	65	1,812	544	30
Sport fisheries and wildlife	57,060	22,113	39	34,947	61	6,090	38	1
Commercial fisheries	670	402	60	268	40	1,799	1,080	60
Recreation	210,800	53,455	25	157,345	75	10,995	1,213	11
Pollution abatement	463,100	135,480	29	327,620	71	5,601	6	1
Public health	9,400	--	0	9,400	100	7,700	--	0
Project¹								
Highlands ²	0	0	0	0	0	0	0	0
Cedar Creek	60,000	26,070	43	33,930	57	1,351	281	21
Dog River	5,000	1,950	39	3,050	61	36	8	20
Atlanta Pollution Abatement	67,800	19,170	28	48,630	72	1,861	--	0
Anneewakee	17,500	11,060	63	6,440	37	890	178	20
West Point	55,800	13,290	24	42,510	76	415	50	12
Middle Chattahoochee	308,700	188,570	61	120,130	39	1,703	879	52
Columbus-Phenix								
City	7,200	3,600	50	3,600	50	22	--	0
Omussee	2,250	--	0	2,250	100	42	--	0
Spewell Bluff	67,500	13,600	20	53,900	80	588	75	13
Lazer Creek	44,900	3,250	7	41,650	93	494	40	7
Lower Auchumpkee	50,200	7,860	16	42,340	84	395	40	10
Lower Flint River	66,800	31,670	47	35,130	53	560	271	48
Muckalee Creek	3,400	495	15	2,905	85	58	--	0
Kinchafonee Creek	1,500	770	51	730	49	21	--	0
Chipola River	3,100	--	0	3,100	100	192	--	0
Apalachicola Bay oyster development	430	258	60	172	40	766	460	60
Water-access areas	20,000	8,000	40	12,000	60	1,235	186	15
Upstream watersheds	30,400	15,040	49	15,360	51	400	--	0
Flood control levees	5,200	2,600	50	2,600	50	65	--	0

NOTES: ¹ Costs for purposes and projects are not additive. Costs of projects are included as part of the cost by purpose.

² Data shown in Appendix 1, Savannah Basin.

only suggestive. Further study may result in different costs and cost-sharing arrangements. It should be recognized that for all of the purposes listed here there are important non-Federal expenditures which are in no way covered by this Report as they are outside the problem areas considered by the Commission; for example, thermal power which is recognized but not included in the plan.

Financing

In 1960, Federal, State, county, local, and private expenditures for resource development in the Apalachicola-Chattahoochee-Flint basins totaled about \$77 million. This was equivalent to about 2.5 percent of the basins total personal income. An estimated 15 percent of this expenditure was for training, technical aid, and other items not included in the comprehensive plan.

This left the equivalent of slightly more than 2 percent of the personal income available for operation, maintenance, and replacements of existing facilities and for new and additional developments corresponding to those in the plan.

The projects and programs covered by this Appendix involve some private expenditures and some items of public expenditure which have been made since January 1, 1960, the starting date used for the evaluation. The annual personal income in the basins is expected to be about \$5,565 million by the year 1975 and about \$17,256 million by the year 2000. An increasing annual expenditure will be required to accomplish the proposed basins plan; however, if the current proportion of personal income is continued to be invested in resource development to the year 2000, funds would be more than adequate to accomplish the plan.

The 1960 rate of expenditure for resource development in the Apalachicola-Chattahoochee-Flint basins in relation to personal income is slightly lower than other basins in the study area. This annual rate of expenditure, in relation to projected personal income, should be maintained to accomplish the early action developments in the plan. The developments shown to be needed during the last 25 years of the study period can be accomplished by a slightly diminished annual rate of expenditure in relation to the greatly increased personal income projected for this same period. The reduced rate is due in part to the omission of some developments which undoubtedly will be needed immediately following year 2000. These developments are omitted because the long-range projection of economic conditions used in establishing resources needs was not carried beyond year 2000. It will be necessary, however, to start construction of some projects not included in the plan prior to the turn of the century in order not to cause a lag in resource development.

Studies indicate that the rate of expenditures for resource development in the Apalachicola-Chattahoochee-Flint basins involves capital outlay and operation, maintenance, and replacements costs during the period 1960-75 which would about equal the expected normal increase of these expenditures at all levels of private and governmental activity needed to accomplish the early action phase of the basins

plan. While this is generally correct on an overall basis, each contemplated improvement will need to be studied in regard to its particular source of funds.

The Federal expenditure rate in the Apalachicola-Chattahoochee-Flint basins is expected to be maintained, however, the majority of funds will have to come from non-Federal sources such as State and local governments, individuals, and, private enterprises. In the case of State and local government, needed funds usually come from bond issues, development funds, and authority financing in order to avoid overstressing the current tax base and to enable funds in the hands of individuals and private enterprises to be currently available for the non-Federal components of the plan.

Responsibility

The responsibility for initiating the plan basically must rest with the State and local interests. Even in those fields where a Federal agency is normally the organization which actually performs the detailed planning and construction, the impetus for the planning study must originate with those whom the programs and facilities will benefit.

The comprehensive plan for the Apalachicola-Chattahoochee-Flint basins is a combination of projects and programs formulated to meet the needs of the people for land and water resource development. In most cases the Commission studies have not been carried beyond the reconnaissance level, and thus additional detailed planning is required prior to implementation of the plan. The authorizing Act specifically provides that the Commission plan shall not include final project designs and estimates.

The proposed assignment of responsibility for initiating the developments is made in the knowledge that timely and active interest on the part of the State and local leadership is required.

The designations included in Table 4.17 are made in accordance with the following criteria:

(I) If an existing project or program is to be expanded by the addition of facilities or acceleration of activity, then the assignment of major responsibility for planning, construction and/or development, and operation is to the agency already having jurisdiction over the existing

project or program. For example; if additional recreation facilities are to be provided at a project such as Lake Lanier, which is a Federal project under the administrative supervision of the Corps of Engineers, then this agency would be given major responsibility for planning and construction even though the work might be actually done by other Federal or non-Federal entities under appropriate arrangements with the Corps of Engineers.

(2) Where additional facilities are proposed at a project under non-Federal jurisdiction, then the non-Federal interest is assigned the major responsibility. Exception may be made in the case of installation of navigation locks in non-Federal dams which would be worked out by joint agreement between the non-Federal entity and the Corps of Engineers.

(3) Non-Federal programs such as forestry, soil conservation, recreation, fish and wildlife, reclamation, drainage, irrigation, public health, and pollution abatement would continue under non-Federal sponsorship except where such programs apply to national forests, military reservations, and other Federal holdings. Where a clear-cut conclusion is not readily apparent, then selection is to be made on a case-by-case basis, giving due weight to the pertinent circumstances.

(4) New projects or programs are assigned to Federal agencies for planning, construction, and operation where there is a substantial involvement of hydroelectric power and navigation since this is the general historical pattern. Exceptions are made in the application of this general rule for hydroelectric power facilities where it was found desirable that such facilities be constructed by non-Federal interests either in their entirety or by contractual agreement with Federal interests. Exception is also made in the case of navigation improvements where the major portion of benefits is other than commercial navigation.

(5) Historical patterns are also observed in the case of flood control. If the project involves the provision of local protection works on the main stream, then the Federal interests would be responsible for construction and non-Federal interests would take care of operation and maintenance. In the case of flood plain management and small reservoir developments located in headwater areas to serve flood control purposes,

planning, construction, and operation are designated as non-Federal, although local groups may call upon Federal agencies for assistance in planning.

(6) In the application of the general rule and the cited exceptions, the incidence of benefits is considered in determining appropriate responsibility. Where benefits are of national significance, Federal responsibility is indicated; where they are local, non-Federal responsibility is indicated. Where these benefits are of regional significance, the matter is decided on a case-by-case basis, considering all of the related circumstances.

(7) In the designation of non-Federal and Federal interests for the major responsibility, there is no intention that such selection would ignore the other interests that may be concerned in planning the details of the proposed program or project. This applies also to construction and operation.

The designation of Federal agencies to have major responsibility for projects and programs generally is made on the basis of the agency usually associated with the purpose having the largest portion of the total allocated costs except for projects involving hydroelectric power and substantial mainstem flood control which are assigned to the Corps of Engineers.

The non-Federal or Federal interests with the major responsibility for accomplishment, including coordinating the preauthorization planning, obtaining final approval or authorization of specific works or facilities, budgeting for appropriations or other funding, design of structures, administration of construction or installation, and other matters pertinent to planning and construction are indicated in Table 4.17. The designation of Federal or non-Federal is not intended to prejudice joint non-Federal and Federal development.

Designation of a Federal agency as having the major responsibility for the Federal aspects of each project, regardless of the magnitude of these Federal aspects, is not intended to reflect any lack of interest by other Federal agencies in a project; in fact, most of the Federal land and water agencies have some interest in each of the projects.

In the general programs and projects, other than those specifically mentioned in Table 4.17, the division between non-Federal and Federal

TABLE 4.17
Responsibility for Implementing Projects

Major responsibility for implementing designated projects		Project	Early action phase¹	Purpose¹	Federal agency with major responsibility for Federal aspects
Non-Federal	Federal	Cedar Creek-----	E	P, FC, R, F&W	Corps of Engineers
Non-Federal	--	Dog River-----	--	PA, F&W	Public Health Service
Non-Federal	--	Atlanta Pollution Abatement-----	--	PA, P	Public Health Service
Non-Federal	--	Anneewakee-----	E	R, F&W	Bureau of Outdoor Recreation, National Park Service ²
--	Federal	West Point-----	E	P, FC, R, F&W	Corps of Engineers
--	Federal	Middle Chattahoochee-----	--	N, P, R, F&W	Corps of Engineers
--	Federal	Columbus-Phenix City-----	E	FC	Corps of Engineers
Non-Federal	--	Omussee-----	--	R, F&W	Bureau of Outdoor Recreation, National Park Service ²
Non-Federal and Federal		Spewrell Bluff-----	E	P, FC, N, R, F&W	Federal Power Commission and Corps of Engineers
Non-Federal and Federal		Lazer Creek-----	E	P, FC, N, R, F&W	Federal Power Commission and Corps of Engineers
Non-Federal and Federal		Lower Auchumpkee-----	E	P, FC, N, R, F&W	Federal Power Commission and Corps of Engineers
--	Federal	Lower Flint-----	--	N, P, R, F&W	Corps of Engineers
--	Federal	Muckalee-----	--	FC, WS, R, F&W	Corps of Engineers
--	Federal	Kinchafoonee-----	--	FC, F&W	Corps of Engineers
Non-Federal	--	Chipola-----	E	R, F&W	Bureau of Sport Fisheries and Wildlife
Non-Federal	--	Apalachicola Bay-----	E	F&W	Bureau of Commercial Fisheries
--	Federal	Flood Control Levees-----	E	FC	Corps of Engineers

NOTES: ¹ E —Early action phase development

P —Hydroelectric power

R —Recreation

F&W—Fish and wildlife

N —Navigation

PA —Pollution abatement

FC —Flood control

² Designated agency depends on the established division of responsibility between the Bureau of Outdoor Recreation and National Park Service.

principal responsibility is made on the basis of ownership of the land or area involved. For example, wildlife or soil conservation programs on non-Federal lands are the principal responsibility of non-Federal entities; forestry programs on a military reservation or national forest are a principal Federal responsibility; and recreation programs on a Federal multiple-purpose reservoir project, which envisions Federal acquisition of the general reservoir area, are a principal Federal responsibility.

Early Action Phase

Action to achieve the comprehensive plan for the 1960-2000 period must be continued throughout the period to develop the basins resources in an orderly manner and to help stimulate growth in the basins economic structure. In

order to meet immediate requirements, certain of the projects and programs contained in the comprehensive plan for the basins should be initiated as quickly as detailed plans can be prepared and other necessary arrangements including financing are made. These more urgent projects and programs have been included in the action phase of the program to be accomplished, or in the process of accomplishment, by 1975. The action phase in this study covers the period from 1960 to 1975, so part of the plan which is included in the continuing programs has been accomplished prior to the completion of this Report. Other parts of the plan that should be underway, however, involve physical and institutional problems that are causing delays. If the proposed 15-year program is actually completed by 1975, it would mean accomplishing the major part of the construction work in

10 years or less. If the program is delayed, there will be a related delay in the area economic activities; and the established goals will not be reached until some time after 1975. If a balanced development program is carried out, some delay would not seriously affect the benefits expected.

While most of the projects and programs included in the plan involve some degree of Federal and State participation, they are, almost without exception, the types of development that must be initiated at the local level. One of the first steps required to insure the success of a needed development is that the local public be informed about the type of development being considered, the need for that development, and the results that are expected in terms of benefits and costs. When the local consensus is that the development should be undertaken, active local support will make it possible for the agency or group carrying primary responsibility for the physical development to move expeditiously and with confidence. Local service organizations or other public membership groups seldom supervise the actual planning, construction, or operation of resource development works, but they generally provide the motivating force that gets them started. They can also contribute greatly in solving cost sharing, financing, and other problems that must be solved before construction can be undertaken.

In the Apalachicola-Chattahoochee-Flint basins many programs for conserving, developing, and utilizing land and water resources have been in operation for some time. Their continuation, expansion, and improvement form an important part of the comprehensive plan. Action for implementing new or expanded aspects of these programs will be needed throughout the life of the plan and will generally increase gradually in proportion to population and economic growth. However, there are certain components of these programs on which action should be started early. Included in this category are improvement works having a long timelag between initial action and full utilization, activities for conserving and protecting resources for future use, and items that require special emphasis or action to bring them in balance with general development.

Early action should be initiated and detailed studies completed on the six major water control

projects. The land area should be acquired as early as practicable, the dams and reservoirs constructed, and minimum basic facilities for recreation and fishing installed to satisfy existing needs mainly for power, flood control, recreation, and fish and wildlife use to meet expanding needs to 1975. Acquisition of the land prior to 1975 for projects to be constructed later should be considered.

Increments of the water supply program for domestic, municipal, and industrial uses should be installed to keep current with the needs of the population. Unless this is done, detrimental shortages and possible competition between users could occur, and economic growth would be hampered. It is estimated that about 35 percent of the total investment costs for the water supply program would be expended in the early action phase.

Immediate action should be taken to develop a long-range plan for the adequate handling of liquid wastes. Such wastes must ultimately be discharged into the water courses, and volume will increase in direct proportion to growth and development. Unless long-range pollution abatement plans are followed, water resources will be damaged and beneficial uses impaired. It is estimated that about 40 percent of the total investment costs for treatment facilities would be required by 1975. In addition, streamflow regulation should be initiated as a complementary measure in the water quality control program.

The public health programs of vector control, solid-waste collection and disposal, and air pollution and radiation monitoring should also be initiated to protect and maintain the healthful environment of the basins for the benefit of its residents and attraction for the location of industry, as well as tourists and recreationists. It is expected that these programs would be initiated and carried out on an annual operation and maintenance basis.

Land should be acquired for 116 water-access areas and facilities to be installed to accommodate about 2,200,000 user-days annually for recreation and about 188,000 user-days annually for fishing to meet the needs of the population and tourists associated with the early action levels of development. It is estimated that nearly 50 percent of the investment cost of the total access areas should be included.

For the recreation program, in addition to

the multiple-purpose projects, needed facilities should be installed to accommodate about 19 million user-days of outdoor recreation by the year 2000. Some features of the long-range recreation program will require action ahead of that required for gradual development to meet current needs. These include: (1) Acquiring, leasing for extended periods, or otherwise preserving for future public use, needed land along the Gulf of Mexico, land at historic sites, and additional land at existing recreation areas; and (2) the installation of basic facilities required for future expansion. It is estimated that about 30 percent of the investment cost for the single-purpose recreation program would be expended as part of the early action phase.

Upstream watershed projects should be installed to alleviate existing problems and provide watershed protection, flood prevention, drainage, and water resources development for the improvement of agricultural lands and other areas. About 80 percent of the installation costs of the upstream watersheds would be incurred by 1975.

The installation of irrigation and drainage programs will depend to a great extent on the desires and needs of individuals and small groups to replace marginal units, improve farm efficiency, and improve land use as alternatives to other improved management practices. It is estimated that about 60 percent of the irrigation and drainage programs would be accomplished in the early action phase.

While the utilization of soil resources will be largely controlled by current requirements, all reasonable effort should be expended to apply adequate soil conservation practices as quickly as possible on all land not now protected. Permanent conservation measures remaining to be applied should be installed in the early action phase to the maximum extent possible. About 50 percent of the total installation of this program would be expended by 1975.

To protect and conserve forests for future use, the major parts of tree planting and fire-, insect-, and disease-control facilities should be installed in the early action phase. To facilitate the present and future operation of the forestry program, forestry education and research should be given early emphasis, and drainage and road facilities should be installed. It is estimated that about

45 percent of the total investment costs for forest conservation and utilization will be required in the early action phase.

The improvement of existing wildlife facilities, extensive development, and supporting programs of research, education, and enforcement activities should be initiated promptly. Likewise for sport fishing, improvement of existing facilities on the rivers and fresh-water impoundments, new facilities on salt water, and supporting activities should be initiated in the early action phase. Most of the expenditures for the wildlife and sport fishery program would be operation and maintenance that will be carried out on an annual basis. Most of the need for additional investment costs will occur in the latter part of the study period. Only about 15 percent of the total investment cost would be expended in the early action phase.

The commercial fisheries program should be initiated to expand this industry. A large percent of the investment costs, which represent only a very small part of the total costs, would be expended in the early action phase to help restore this basic local industry.

TABLE 4.18
Summary of Early Action Investment Costs
(thousands of dollars)

Project or program	Investment to 1975
Cedar Creek	51,800
Anneewakee	8,500
West Point	53,000
Columbus-Phenix City	5,000
Spewrell Bluff	66,000
Lazer Creek	43,500
Lower Auchumpkee	49,500
Chipola	1,800
Apalachicola Bay	430
Water-access areas	9,900
Upstream watersheds	25,000
Flood control levees	1,000
Water supplies	*126,900
Irrigation	1,500
Drainage	*219
Soil conservation	28,050
Forest conservation	56,520
Fish and wildlife	*3,843
Recreation	*27,200
Pollution abatement	*147,400
Public health	5,000

* Cost excludes expenditures associated with multiple-purpose projects listed above.

SECTION V – PROJECTS AND PROGRAMS

The comprehensive plan for the Apalachicola-Chattahoochee-Flint basins includes both specific projects, usually multiple purpose in concept, and general programs, usually single purpose in concept but which often involve compatible multiple uses. The developments, both specific projects and general programs in combination, are necessary to meet the growing resources development needs. Resource developments either existing or under construction as of 1960 are a necessary part of the plan, however, only the proposals for new developments and for expansion of existing developments to be made during the period 1960-2000 are presented in this Section.

In order to bring the data for multiple-purpose developments together and to provide analysis of costs and benefits by States, each project and single-purpose development is summarized in the pages that follow. Data for entire projects and single-purpose developments are

provided and investment costs to be incurred in the early action phase are also shown.

Project design, quantity estimates, and areas required were taken from earlier reports, or were based on observations made on reconnaissance field surveys, topographic maps that have contour intervals of 10 to 50 feet, and available hydrographic data. Instrumental surveys were limited to one cross section taken at the damsite for each of the proposed water storage projects where previous surveys had not been made.

In addition to the impacts discussion for each project and program in this Section, more general economic impacts stemming from the comprehensive plan are discussed in Part Four, Section III, Impacts of the Plan.

All elevations shown are related to mean sea level. Spillway discharges shown were estimated for a reservoir water surface at maximum pool elevation.

HIGHLANDS PROJECT

Location

The Highlands project contains all land and water area within the Blue Ridge physiographic province in the Southeast River Basins. It encompasses about 805,000 acres, including about 150,000 in the Apalachicola-Chattahoochee-Flint basins and about 655,000 in the Savannah basin. The project area includes portions of North Carolina, Georgia, and South Carolina. Most of the project lies in the Savannah basin so details of the plan and its results are given in Appendix 1. The data that follow pertain only to the Apalachicola-Chattahoochee-Flint portion of the project and are shown here merely to account for all developments within the Apalachicola-Chattahoochee-Flint basins.

Plan

The plan includes acquisition of land and construction of facilities to improve recreational use of the area; improved and intensified management practices to meet the trout fishery

demand; full utilization of the wildlife habitat; and extension of the Blue Ridge Parkway into the area. All of the major structures are in the Savannah basin.

Increased user-days annually — 2000 (A-C-F portion)		
Fishing	.....	65,000
Hunting	.....	28,000
Recreation	.....	920,000
Total	.....	1,013,000

Data

	Unit	Amount
Land area requiring management	acre	121,500
Stream (trout)	mile	140
Small impoundments	acre	400
Fish hatchery (new)	hatchery	1
Roads	mile	56

Benefits, costs, and allocation of costs are shown in Appendix 1, Savannah Basin.

HIGHLANDS PROJECT AREA
NORTH CAROLINA - SOUTH CAROLINA - GEORGIA

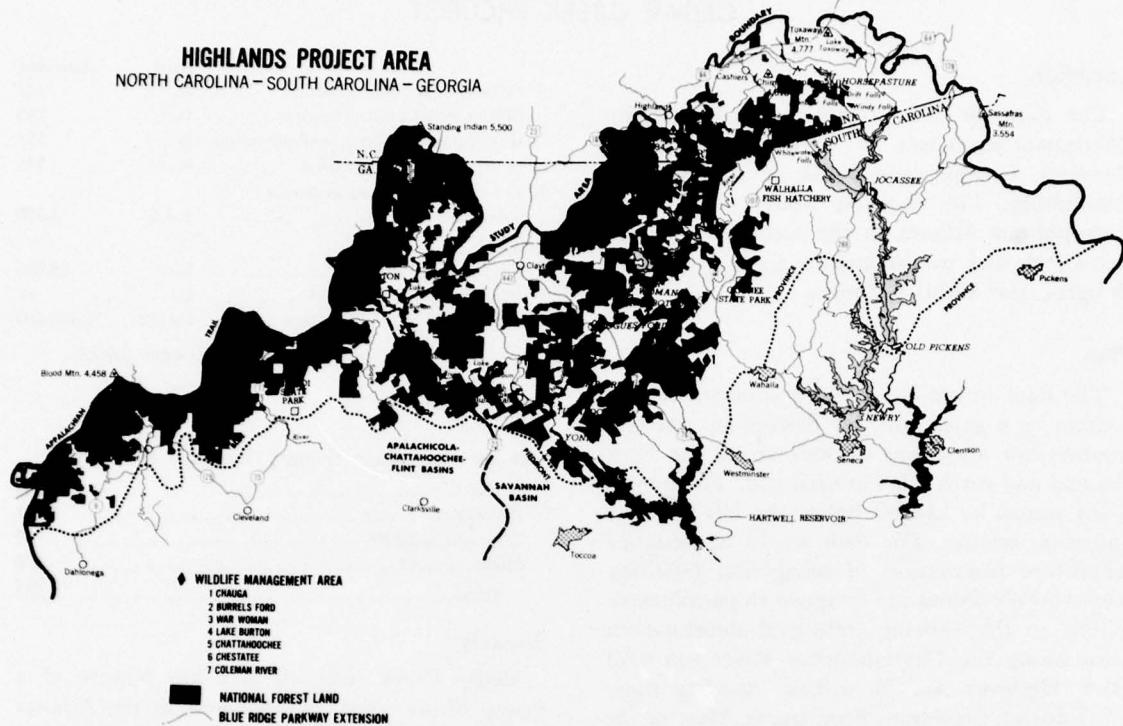


Figure 4.2 *The Highlands Project Area Abounds in Natural Splendor.*

CEDAR CREEK PROJECT

Location

The dam for this project would be on the Chattahoochee River in Carroll and Coweta Counties, Georgia, just south of the town of Whitesburg. The reservoir would extend into metropolitan Atlanta to the vicinity of Peachtree Creek and would include areas in Fulton, Douglas, and Cobb Counties.

Plan

The dam would consist of a concrete section containing a gated spillway flanked by concrete nonoverflow abutment sections across the river channel and earth dikes at each end. The powerplant would be located below the left concrete abutment section. The dam would be designed for future installation of navigation facilities. Reservoir elevations are designed to permit navigation to the existing industrial development areas along the Chattahoochee River south of U. S. Highway No. 78, without flooding those areas during maximum flood stages. Most of the existing river crossings in the Atlanta area have sufficient clearance for the reservoir elevations being considered. Some road relocations will be required in the lower portions of the reservoir. The project would provide an increase of 65,000 user-days of fishing and 4,230,000 user-days of recreation annually by the year 2000.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	2,430
Dam		
Top elevation	ft.	767
Maximum height	ft.	87
Length	ft.	3,350
Spillway		
Crest elevation	ft.	725
Length	ft.	540
Discharge at pool elevation 760	c. f. s.	340,000
Reservoir		
Normal full pool area	acre	16,300
Design flood pool area	acre	26,000
Maximum operating pool area	acre	24,400
Minimum pool area	acre	10,900
Normal full pool capacity	acre-ft.	318,000
Design flood pool capacity	acre-ft.	640,000
Maximum operating pool capacity	acre-ft.	585,000
Minimum pool capacity	acre-ft.	184,000

	Unit	Amount
Normal full pool elevation	ft.	745
Design flood pool elevation	ft.	760
Maximum operating pool elevation	ft.	758
Minimum pool elevation	ft.	735
Minimum flow required in stream below dam	c. f. s.	1,500
Powerplant*		
Installed capacity	kw.	50,000
Average operating head	ft.	51
Average annual generation	kw.-hr.	77,400,000

* Exclusive of Atlanta Pollution Abatement project.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Power	1,364
Recreation	5,371
Fish and wildlife	99
Flood control	399
Total	<u>7,233</u>

Impacts

Cedar Creek reservoir is a key feature of a group of potential developments in the Atlanta area, including the Anneewakee recreation project, the Atlanta Pollution Abatement project, and the Columbus-Atlanta navigation system. It, therefore, is indirectly related to significant economic activities that are not reflected in the tabulated benefits.

Its proximity to the population concentration in the metropolitan Atlanta cities makes it outstandingly significant as a means of meeting recreation needs even to the extent of providing some municipal park-type areas. Such developments would be particularly useful in meeting the needs of lower income groups that are not able to travel to outlying areas. The use of land between elevations 750 and 760 must be restricted to avoid loss of life and property during extreme flood periods, but the area can be available for day use for picnicking, hiking, games, and other similar activities. The area west of the reservoir is included in the Anneewakee recreation project, but compatible use for group camping, cottages, marinas, and other private or semi-private activities would seem to be appropriate. These and other related factors make the Cedar Creek project unique and have led to its designation as a demonstration area, with the intention that use of the acquired land would be care-

CEDAR CREEK PROJECT

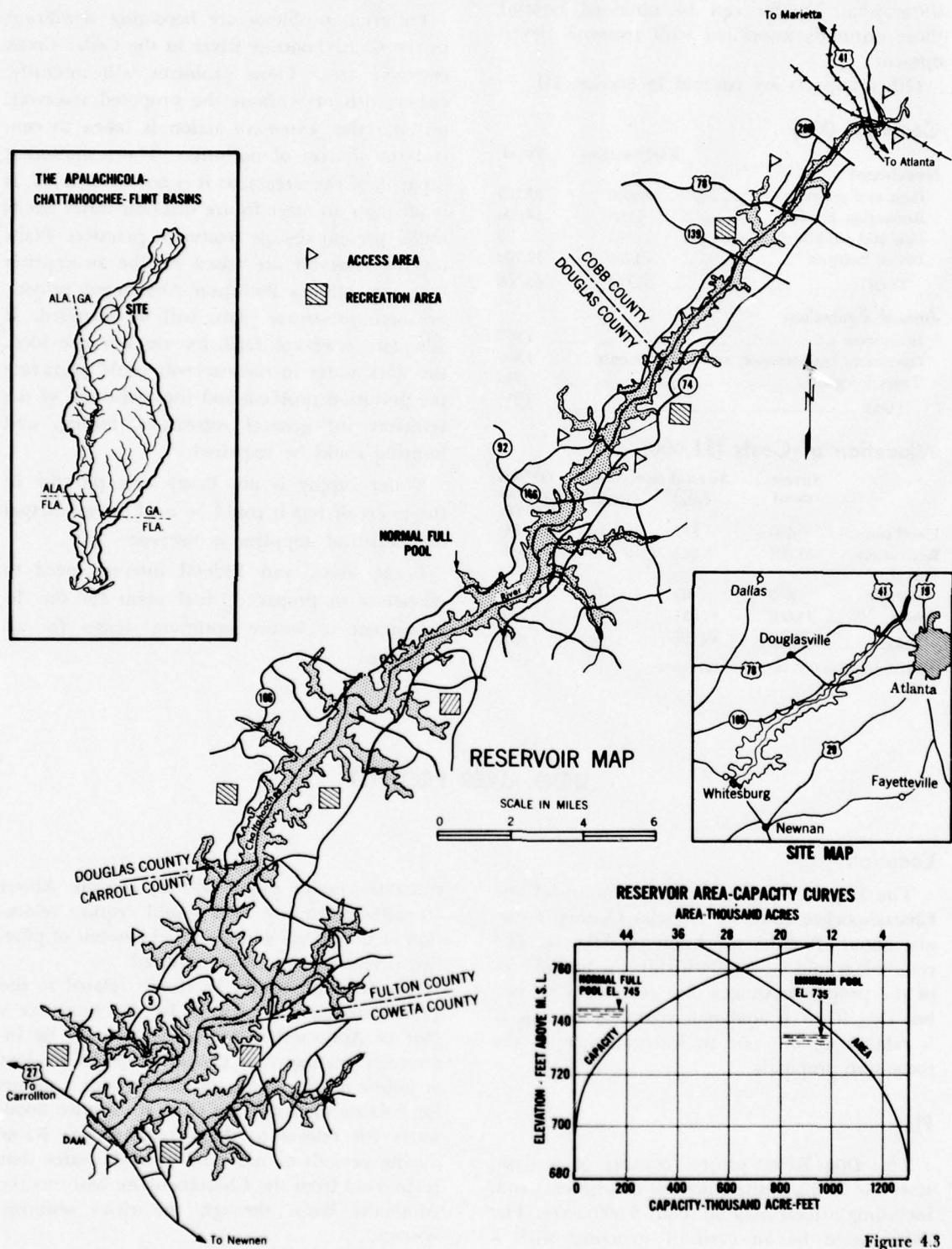


Figure 4.3

fully planned and results carefully recorded to show what benefits can be obtained beyond those normally associated with reservoir development.

Other impacts are covered in Section III.

Costs (\$1,000)

Investment	Early action	Total
Dam and reservoir	32,040	33,225
Recreation facilities	7,000	14,000
Fish and wildlife facilities	60	75
Power facilities	12,700	12,700
Total	51,800	60,000

Annual Equivalent

Investment	2,079
Operation, maintenance, and replacements	1,007
Taxes foregone	385
Total	3,471

Allocation of Costs (\$1,000)

Invest- ment	Annual equivalent		OM&R at year 2000
	Total	OM&R	
Flood control	6,600	327	88
Recreation	33,200	1,824	719
Fish and wildlife	1,600	69	11
Power	18,600	*1,251	189
Total	60,000	*3,471	1,007

* Includes \$385,000 for taxes foregone.

Special Considerations

Pollution problems are becoming significant in the Chattahoochee River in the Cedar Creek reservoir area. These problems will intensify, either with or without the proposed reservoir, unless rather extensive action is taken to control the sources of pollution. The assimilating capacity of the stream, as it is now controlled, is inadequate to meet future dilution water needs under present sewage treatment practices. Plans for the reservoir are based on the assumption that the Atlanta Pollution Abatement project, or some substitute plan, will be installed. If adequate sewerage facilities are not provided, the slack water in the reservoir could aggravate the pollution problem and the usefulness of the reservoir for general recreation, fishing, and hunting could be impaired.

Water supply is not listed as a purpose in the reservoir but it could be used for municipal or industrial supplies if necessary.

Local, State, and Federal interests need to cooperate in preparing final plans for the development to insure optimum design for all purposes.

DOG RIVER PROJECT

Location

The Dog River site is on a tributary of the Chattahoochee River in Douglas County, Georgia, about 20 miles southwest of Atlanta. The reservoir would be wholly within the boundaries of the proposed Anneewakee recreation project but Dog River is analyzed separately because it is related to, but not an integral part of, the recreation proposals.

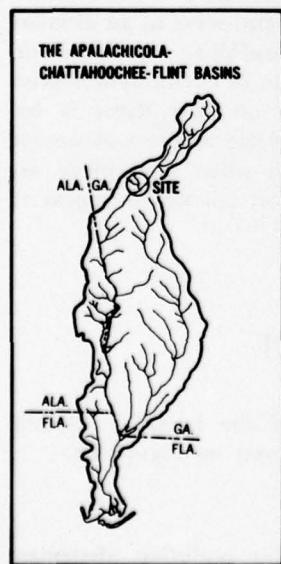
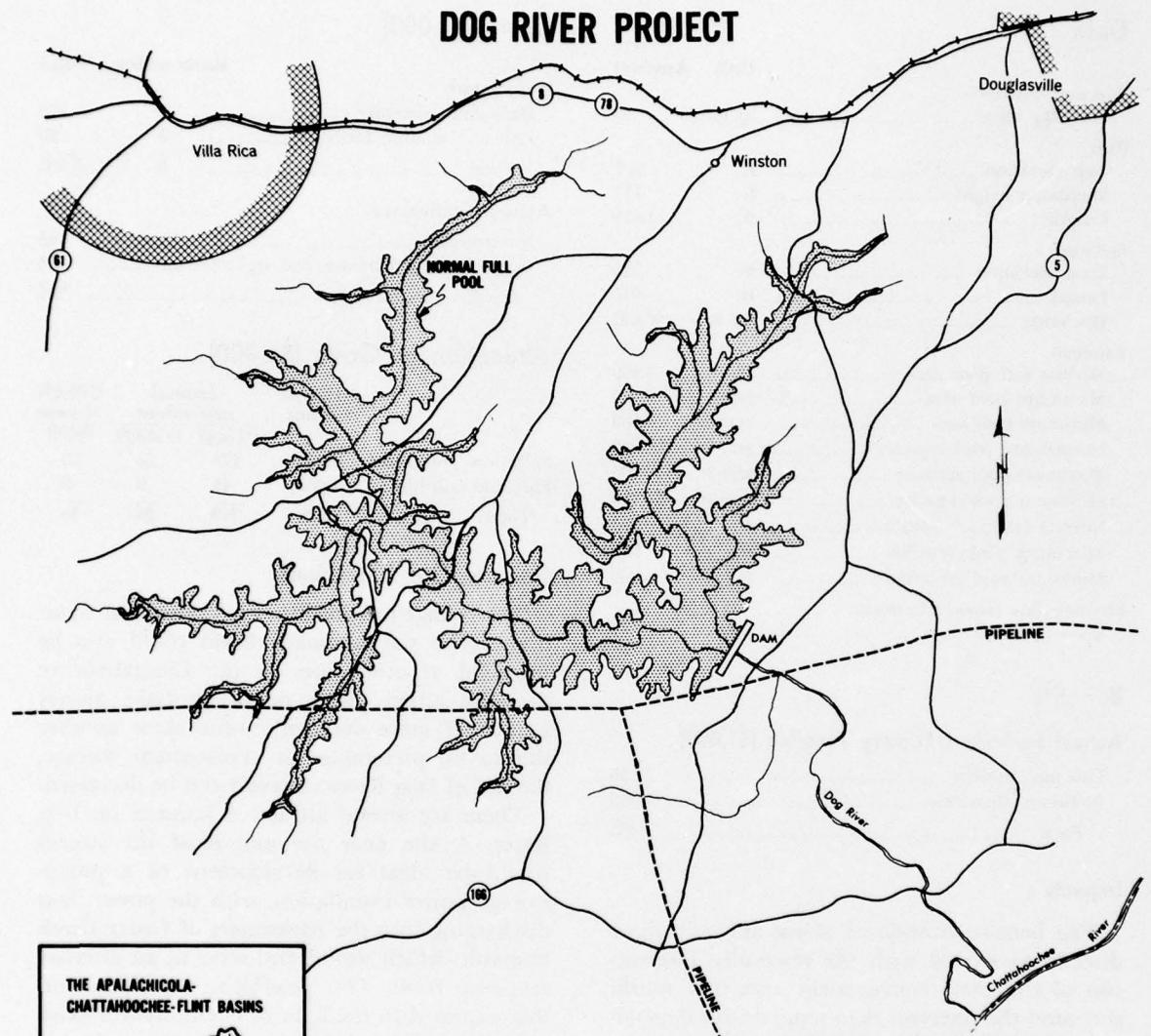
Plan

The Dog River project consists of a dam, reservoir, and a limited amount of adjacent land, including a total area of about 5,000 acres. The dam would be an earthfill structure with a

concrete gravity gated spillway section. About 10 miles of county road would require relocation or protection and a limited amount of pipeline protection would be required.

The reservoir would be closely related to the game management area to be developed as a part of Anneewakee project and would be intensively managed to provide 39,800 user-days of public fishing. It would also provide a means for Atlanta metropolitan cities to capture floodwater for release to the Chattahoochee River during periods of low flow to offset water that is diverted from the Chattahoochee basin to the Altamaha basin through the cities sewerage systems.

DOG RIVER PROJECT



RESERVOIR MAP

SCALE IN MILES
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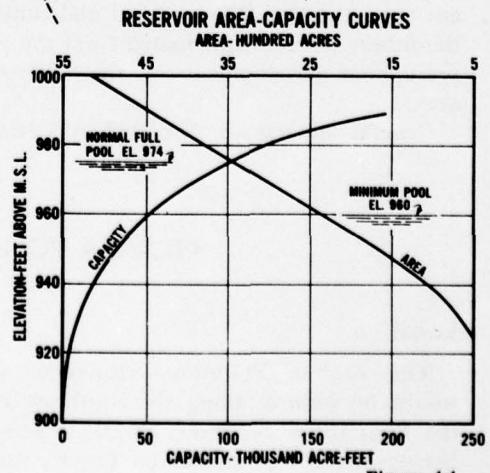


Figure 4.4

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	66
Dam		
Top elevation	ft.	987
Maximum height	ft.	117
Length	ft.	1,455
Spillway		
Crest elevation	ft.	974
Length	ft.	575
Discharge	c. f. s.	48,200
Reservoir		
Normal full pool area	acre	3,400
Maximum pool area	acre	4,000
Minimum pool area	acre	2,300
Normal full pool capacity	acre-ft.	100,000
Maximum pool capacity	acre-ft.	120,000
Minimum pool capacity	acre-ft.	50,000
Normal full pool elevation	ft.	974
Maximum pool elevation	ft.	982
Minimum pool elevation	ft.	960
Minimum flow required in stream below dam	c. f. s.	20

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Fish and wildlife	56
Pollution abatement	279
Total	335

Impacts

The benefits considered above are only those directly associated with the reservoir. The success of the game management area that would surround the reservoir is to some degree dependent upon the Dog River project and conversely, the fishery benefits anticipated from the project presuppose development of the management area.

General impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	0	4,970
Fish and wildlife facilities	0	30
Total	0	5,000
Annual Equivalent		
Investment		183
Operation, maintenance, and replacements		36
Total		219

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution abatement	4,000	174	28	28
Fish and wildlife	1,000	45	8	8
Total	5,000	219	36	36

Special Considerations

The storage provided for replacement of water diverted to the Altamaha basin could also be provided at other sites in the Chattahoochee drainage either above or below Lake Sidney Lanier. If more detailed studies show another site to be preferable for replacement storage, the size of Dog River reservoir can be decreased.

There are several attractive damsites on Dog River. A site near the mouth of the stream would be ideal for development of a pump-storage power installation, with the powerplant discharging into the backwaters of Cedar Creek reservoir, which would also serve as an afterbay to pump from. This possibility should be further explored in the light of circumstances existing when construction on Dog River is imminent. If less than 100,000 acre-feet of storage is found to be needed when final plans are made, a site farther upstream would appear to be preferable.

ATLANTA POLLUTION ABATEMENT PROJECT

Location

The Atlanta Pollution Abatement project would be located along the southeast side of the Chattahoochee River, in the general area between Peachtree and Cedar Creeks, west and

south of the center of the heart of Atlanta. Project facilities are shown on Figure 4.5.

Plan

The general plans for pollution abatement

include primary and secondary treatment for all industrial and municipal wastes prior to their discharge into the watercourses of the basins. Where tertiary treatment or storage for dilution water purposes is necessary, multiple-purpose developments have, when practical, been designed to meet this extraordinary need.

The Atlanta metropolitan area complex presents a difficult problem in the pollution abatement field. The cities in the Atlanta group are so located that drainage from the urbanized area is divided among the Chattahoochee, Flint, and Altamaha River basins. The metropolitan area is currently diverting about 200 cubic feet per second from the Chattahoochee, about 70 second-feet of which finds its way into the Altamaha and Flint basins as return flow or sewage-plant effluent. By the year 2000, it is anticipated that about 208 cubic feet per second will be pumped over the divides into the Flint and Altamaha portions of the cities. A part of this out-of-basins diversion will be consumptively used, leaving about 190 cubic feet per second that is expected to appear in the Flint and Altamaha Rivers as sewage plant effluent. There is no reasonable source of dilution water for the Flint River, so plans for the Altamaha basin cover future diversion of the Flint River effluents into the Altamaha and providing some tertiary treatment before releasing the flows into that stream.

There is always the possibility that, during periods of low flows, the diversion of water from the Chattahoochee to the Altamaha may create hardships to downstream riparian users on the Chattahoochee and Apalachicola Rivers. This diversion creates losses of power and other benefits in the Chattahoochee system, although it provides some gains in benefits on the Altamaha side. In order to compensate for these losses in the Chattahoochee, storage has been provided in the Dog River project as a means of providing replacement for the diverted water. Floodflows totaling 50,000 acre-feet would be stored in a reservoir on Dog River for release when needed to augment low flows in the Chattahoochee River by the amount being diverted into the Altamaha system. Storage for the same purpose could be provided at any one of several alternative sites either above or below Lake Sidney Lanier. Dog River is considered representative,

but not exclusively essential, for meeting the need.

Metropolitan Atlanta also has an impending pollution problem in the Chattahoochee River. Even with secondary treatment, sewage effluents from the Atlanta area will ultimately create pollution problems in the Chattahoochee. The recorded 7 consecutive day low flows in the Atlanta area are about 400 cubic feet per second. Operating procedures for Buford reservoir call for sufficient releases from the reservoir to provide at least 650 cubic feet per second at Atlanta. By the year 2000, adequate dilution of the sewage plant effluents would require a flow of about 3,000 cubic feet per second.

Cedar Creek project is included in the basins plan to meet power, flood control, and other functional needs. The reservoir would slack-water the river downstream from Peachtree Creek in the area where effluent from existing treatment plants is being discharged. When Cedar Creek reservoir is built, the pollution will be associated with the reservoir and may be an even more significant problem. Either with or without the Cedar Creek project, some action will be needed to protect the surface water quality.

Solution of pollution abatement problems for a densely populated area like metropolitan Atlanta involves many considerations far more detailed than the studies and plan of the Commission. The suggestions made here are intended to indicate the magnitude and significance of the problem and to provide a basis for general estimates. Further study may result in changes in the suggested plan but it is believed that desirable changes could be made within the general magnitude of the costs that are being considered. The problem should be given careful and detailed study before any final course of development is adopted.

With these reservations in mind, it is proposed that a collection system be installed to pick up the discharges from the several sewage treatment plants that are now or will be located on the east side of the Chattahoochee River, and to carry those effluents in pipe to a small regulating reservoir in the vicinity of Cedar Creek damsite. Some tertiary treatment could be provided before the wastes reach the regulating reservoir by pumping oxygen or air into the

transmission pipe system. Pumps would be required along the line for moving the wastes. From the regulating reservoir the sewage effluent would be piped to a power turbine in the Cedar Creek powerplant, or to a separate plant below the damsite. Revenues from the power generation would offset a part of the power required for pumping the wastes. Discharges of the treated waste from the powerplant turbines could be coordinated with the discharges from Cedar Creek reservoir without creating significant pollution problems in the river below the dam. The regulating reservoir would have enough storage capacity to permit synchronizing releases with those from Cedar Creek powerplant so that proper sewage-dilution relations could be maintained at all times. This system or some alternative should be considered, irrespective of whether or when Cedar Creek reservoir is built.

Data

	Unit	Amount
Dam		
Top elevation	ft.	765
Average height	ft.	11
Length	ft.	1,500
Reservoir		
Normal full pool area	acre	45
Maximum pool area	acre	100
Minimum pool area	acre	15
Normal full pool capacity	acre-ft.	355
Maximum pool capacity	acre-ft.	1,000
Minimum pool capacity	acre-ft.	100
Normal full pool elevation	ft.	755
Maximum pool elevation	ft.	760
Minimum pool elevation	ft.	750
Pipeline		
Length	mile	40

	Unit	Amount
Powerplant		
Installed capacity	kw.	10,000
Average operating head	ft.	63
Average annual generation	kw.-hr.	20,000,000

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Pollution abatement	8,375
Power	285
Total	8,660

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	0	1,500
Pollution abatement facilities	0	63,000
Power facilities	0	3,300
Total	0	67,800

Annual Equivalent

Investment	2,404
Operation, maintenance, and replacements	1,861
Taxes foregone	77
Total	4,342

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution				
abatement	63,900	4,073	1,773	1,773
Power	3,900	*269	88	88
Total	67,800	*4,342	1,861	1,861

* Includes \$77,000 for taxes foregone.

ANNEEWAKEE PROJECT

Location

The Anneewakee project includes an area of about 40,000 acres adjacent to and southwest of the cities of metropolitan Atlanta, in Carroll, Douglas, Cobb, Coweta, and Fulton Counties, Georgia.

Plan

Included within the outer limits of the project area are 35,000 acres of land proposed for public acquisition in connection with the Cedar Creek

project and 5,000 acres to be acquired for the Dog River project. Thus, a gross of about 80,000 acres could be publicly managed as a part of, or in conjunction with, the Anneewakee project. The areas would be contiguous, but the outer boundaries would be irregularly shaped to protect existing areas of intensive use to the extent practicable. Some existing developments within the outer limits of the project could remain as isolated private ownerships. As much as 17,000 acres of the area could be adequately controlled by easement or lease.

The project would provide recreation, game management, and fishing and hunting areas near metropolitan Atlanta with its large population concentration. It would conserve an area that has low agricultural productive capacity, preventing an incompatible development for residential or industrial use that will probably occur if the land is not acquired or its use otherwise controlled in the very near future. The population density of the area is low but subdivision development is underway in some areas.

That portion of the area west of the Chattahoochee River is rugged and steeply sloped. Three streams, Anneewakee Creek, Little Bear Creek, and Dog River, provide the major drainage. Gradients in Anneewakee Creek and Dog River are steep. Elevations drop from 1,000 to 750 feet mean sea level in less than 4 miles.

Dog River, the principal stream, is a watercourse more typical of a lower mountain province stream than one centered in the Piedmont province. It is characterized by short pools and long rapids, strewn with massive boulders and bordered by rocky cliffs. Fishing, camping, and hiking along the stream are popular sports. There is some hunting in the area.

The area has land and water resources capable, with development, of providing the opportunity to satisfy the recreation, hunting, and fishing needs of thousands of people daily, including swimmers, boaters, campers, hunters, fishermen, picnickers, and others seeking the advantages of naturally attractive outdoor areas. The increased annual use is estimated to be:

Increased user-days annually — 2000	
Hunting	30,000
Fishing	85,000
Recreation	3,000,000
Total	3,115,000

Essential to development of the area would be providing access roads, parking areas, group camp areas, boat ramps, bathing areas, bathhouses, picnic grounds, trails, and associated facilities. Some water storage would be required, either in a single reservoir or in several smaller reservoirs. There are several attractive damsites on Anneewakee Creek and its tributaries that would be suitable for recreational development. The estimates used in this study are based on a single 1,900-acre reservoir on Anneewakee Creek

that would offer opportunity to meet the recreation needs. More detailed study may show the desirability of constructing two or more smaller reservoirs to disperse activities and/or to decrease costs.

The fish and wildlife aspects of the plan envision development and management of all favorable habitat within the area for both hunting and fishing. Full utilization of the wildlife habitat would require: (1) Establishing an intensively managed 10,000-acre wildlife restoration area in the vicinity of the Dog River reservoir to be purchased in fee-title; (2) developing an intensive waterfowl habitat and management program on about 1,000 acres of the Cedar Creek reservoir flood zone; (3) obtaining easements, leases, or fee-title for about 17,000 acres to make a contiguous block of the lands to be acquired for Cedar Creek reservoir, Dog River reservoir, the wildlife management area, and the recreation area; and (4) coordinating local, State, and Federal effort in the area to permit optimum use of the area. These measures, in conjunction with the plans for Cedar Creek and Dog River projects, would result in the establishment of an 80,000-acre fish and wildlife management area that would provide deer hunting, limited waterfowl hunting, squirrel hunting, fishing, and other related activities on land open to public use.

Data

The acreage involved in the project is summarized as follows:

	Acres
Normal water surface areas	
Cedar Creek project	*16,300
Dog River project	*3,400
Anneewakee project	1,900
Subtotal	21,600
Acquired land within flood pools	
Cedar Creek project	*8,700
Dog River project	*1,600
Subtotal	10,300
Acquired land for recreation	
Cedar Creek project	*10,000
Anneewakee project	11,100
Subtotal	21,100
Acquired land for wildlife management area	10,000
Land under lease or easement	17,000
Total managed area	80,000
Portion in Anneewakee project	40,000

* Not included in Anneewakee project but to be managed cooperatively with Anneewakee project.

ANNEEWAKEE PROJECT

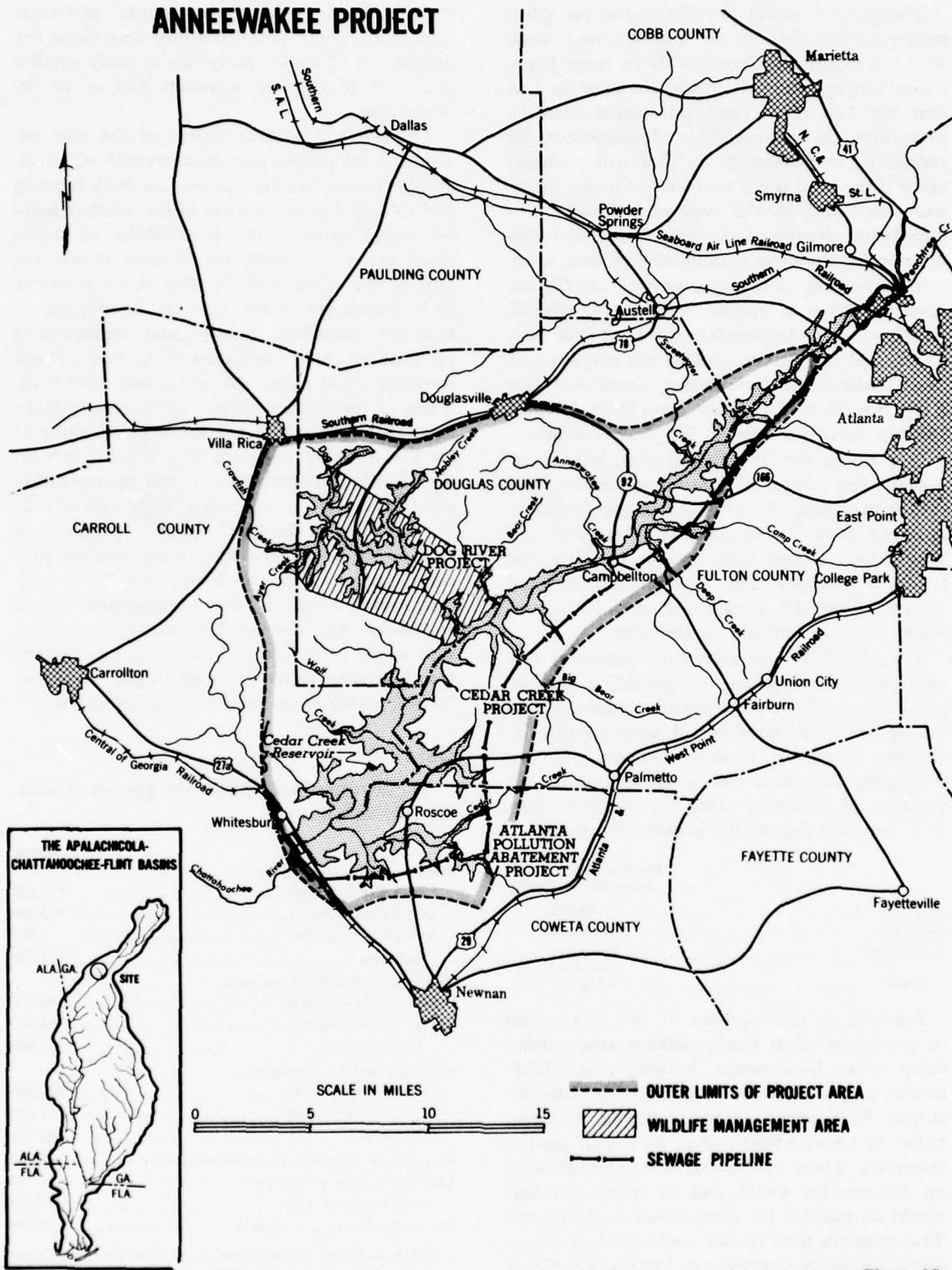


Figure 4.5

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Recreation	3,677
Fish and wildlife	213
Total	3,890

Impacts

The Anneewakee project provides an unusual opportunity for developing all types of recreational and fish and wildlife uses ranging from those that involve no expenditure on the part of the users to facilities and/or activities that require greater outlays. It also provides the opportunity for publicly owned and operated facilities as well as privately developed and/or privately operated recreational enterprises. In order to provide needed background information on the advantages and disadvantages of these various possibilities, from the standpoint of the general public, the project is included with the Cedar Creek project as a demonstration area, and the amount of Federal participation in the cost of the development is therefore somewhat higher than it would otherwise be. In return for this added Federal participation, it is anticipated that special efforts will be made to correlate the development and operation of the proposed facilities with other public and private enterprises in the area, perhaps to some degree on an experimental basis. Similar facilities might be provided at two sites, with the public admitted without charge to one and with charge to the other, to get an indication of the extent to which segments of the public are willing to pay for exclusiveness at publicly sponsored facilities. Thorough records would be kept, an-

alyzed, and the results made available for use in other areas where projects of a similar type are being considered.

Costs (\$1,000)

	Early action	Total
Investment		
Recreation facilities	5,500	13,600
Fish and wildlife facilities	2,000	2,200
Joint facilities	1,000	1,700
Total	8,500	17,500

Annual Equivalent

Investment	547
Operation, maintenance, and replacements	669
Total	1,216

Allocation of Costs (\$1,000)

Invest- ment	Annual equivalent		OM&R at year 2000
	Total	OM&R	
Recreation	13,800	1,019	606
Fish and wildlife	3,700	197	63
Total	17,500	1,216	669

Special Considerations

The lower damsite on Anneewakee Creek could be developed to create a relatively large reservoir that has an attractive potential for power production. It is ideally suited to pump storage use, with Cedar Creek reservoir backwater providing the afterbay. This potential future use of the site should be carefully analyzed so that interim developments for other purposes can be made as nearly compatible as practicable.

WEST POINT PROJECT

Location

The West Point dam would be located on the Chattahoochee River, 2.8 miles north of West Point, in Troup County, Georgia, and to a small extent in Chambers County, Alabama. The reservoir would extend into Heard County, Georgia, and partially into Chambers County, Alabama.

Plan

The project would be a multiple-purpose development for power, flood control, recreation, and fish and wildlife. Provision would be made for future installation of navigation locks, but no navigation facilities are included in the initial development.

The project found to be most practical for

this site would provide a maximum seasonal power pool at elevation 635 feet and a seasonal flood control pool between elevations 625 and 635. The dam would consist of a concrete gated-spillway with nonoverflow abutments across the river channel and earthfill sections to high ground on the left and right banks. The powerhouse would be located just downstream from the left abutment section. A lock site would be provided in the right bank earthfill. There would also be an earth saddle dike 1,075 feet long located 80 feet northwest of the end of the main dam and another dike 355 feet long about 1 mile east of the dam. The powerhouse would contain an initial installation of two 35,000-kilowatt units and one 2,000-kilowatt unit. The reservoir would require the modification or relocation of portions of 5 State and Federal highways, 1 railroad, and 32 miles of county roads. A floodway of 700 acres to provide for a discharge of about 25,000 cubic feet per second would be provided in the 11-mile long reach from the dam to Riverview.

The annual increased use of the area for recreation and fish and wildlife is estimated as follows:

Increased user-days annually — 2000		
Fishing	95,600	
Recreation	400,000	
Total	495,600	

Data

	Unit	Amount
Drainage area	sq. mile	3,380
Dam		
Top elevation	ft.	651
Maximum height	ft.	120
Length	ft.	5,975
Spillway		
Crest elevation	ft.	602
Length	ft.	458
Discharge	c. f. s.	427,300
Reservoir		
Normal full pool elevation	ft.	635
Design flood pool elevation	ft.	644
Maximum operating pool elevation	ft.	641
Minimum pool elevation	ft.	620
Normal full pool area	acre	23,500
Design flood pool area	acre	32,400
Maximum operating pool area	acre	29,000
Minimum pool area	acre	14,300
Normal full pool capacity	acre-ft.	553,000
Design flood pool capacity	acre-ft.	915,000

	Unit	Amount
Maximum operating pool capacity	acre-ft.	700,000
Minimum pool capacity	acre-ft.	271,000

Powerplant

Ultimate installed capacity	kw.	107,000
Average operating head	ft.	68
Average annual generation	kw.-hr.	191,000,000

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Power	2,167
Recreation	748
Fish and wildlife	130
Flood control	747
Total	3,792

Impacts

The storage provided in West Point reservoir will regulate flows for downstream public and private developments making additional floodwater available for use during normal or low-flow periods. The upstream and downstream effects other than flood control have not been evaluated in monetary terms, but it seems apparent that the positive effects would far more than offset any disadvantages that might develop.

Other impacts are discussed in Section III.

Costs (\$1,000)

Investment

	Early action	Total
Dam and reservoir	36,425	37,000
Recreation facilities	1,500	2,000
Fish and wildlife facilities	75	100
Power facilities	15,000	16,700
Total	53,000	55,800

Annual Equivalent

Investment	2,008
Operation, maintenance, and replacements	398
Taxes foregone	554
Total	2,960

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent	OM&R at year 2000
	Total	OM&R 2000	
Power	34,000	•2,019	239
Recreation	2,500	188	105
Fish and wildlife	2,600	109	14
Flood control	16,700	644	40
Total	55,800	•2,960	415

* Includes \$554,000 for taxes foregone.

WEST POINT PROJECT

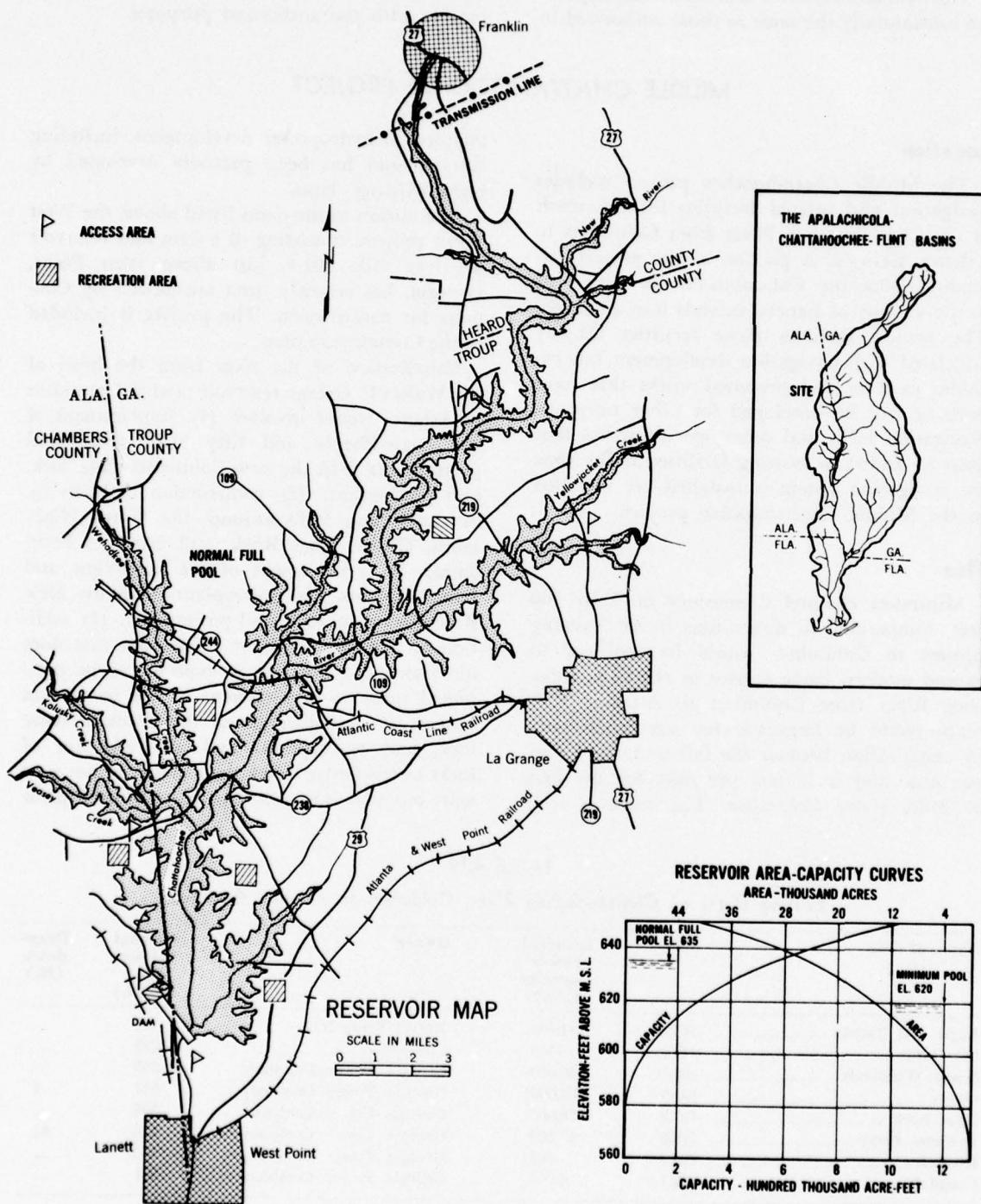


Figure 4.6

Special Considerations

The dam and reservoir included in these plans are substantially the same as those authorized in

the Flood Control Act of 1962 for construction by the Corps of Engineers. Other facilities vary from the authorized project but are not incompatible with the authorized purposes.

MIDDLE CHATTAHOOCHEE PROJECT

Location

The Middle Chattahoochee project includes navigation and related facilities for the reach of the Chattahoochee River from Columbus to Atlanta, Georgia. A portion of the project, extending from the Columbus-Phenix City area to the vicinity of Lanett, extends into Alabama. The project includes those facilities directly associated with navigation development but excludes existing and proposed works that have been or will be developed for other purposes. Navigation locks and other specific works that must be added to existing facilities at the time the navigation system is installed are included in the Middle Chattahoochee project.

Plan

Minimum channel dimensions of 9 by 100 feet, comparable to dimensions in the existing project to Columbus, would be required to extend modern barge service in the Chattahoochee River from Columbus to Atlanta. This reach could be improved for navigation only by canalization because the fall averages 4 feet per mile and is 10 feet per mile for the first 37 miles above Columbus. The reach is well

adapted to hydropower development, including storage, and has been partially developed by eight existing dams.

In addition to the dams listed above, the West Point project, consisting of a dam and reservoir at river mile 201.4, just above West Point, Georgia, has recently been authorized by Congress for construction. The project is included in the Commission plan.

Canalization of the river from the head of the Walter F. George reservoir pool at Columbus to Atlanta would involve: (1) Replacement of the Eagle-Phenix and City Mills dams and powerplants with the new Columbus dam, lock, and powerplant; (2) construction of locks in, or canals and locks around, the North Highlands, Oliver, Goat Rock, and Bartletts Ferry dams; (3) replacement of the Riverview and Langdale dams and powerplants with the New Riverview dam, lock, and powerplant; (4) addition of locks to the West Point dam that does not now exist, but that is expected to be completed prior to development of the navigation system; (5) construction of the Franklin dam, lock, and powerplant; and (6) addition of locks to the Cedar Creek dam that does not now exist but that is expected to be completed prior

TABLE 4.19
Existing Dams on Chattahoochee River, Columbus to Atlanta, Georgia

Name of dam	Mile ¹	Installed power capacity (kw.)	Owner	Normal upper pool (m.s.l.)	Draw-down (ft.)
Eagle and Phenix	160.4	24,100	Reeves Bros., Inc.	—	—
City Mills	161.2	2,180	City Mills	223	—
North Highlands	162.5	30,000	Georgia Power Company	263	—
Oliver	163.6	60,000	Georgia Power Company	337	4
Goat Rock	172.2	26,000	Georgia Power Company	399	—
Bartletts Ferry	178.0	65,000	Georgia Power Company	520	31
Riverview	190.6	480	Georgia Power Company	530	—
Langdale	192.1	4,050	Georgia Power Company	551	—

NOTES: ¹ Above mouth of Chattahoochee River.

² Power generated is used by company plant in Columbus, Georgia.

MIDDLE CHATTAHOOCHEE PROJECT STREAM PROFILES

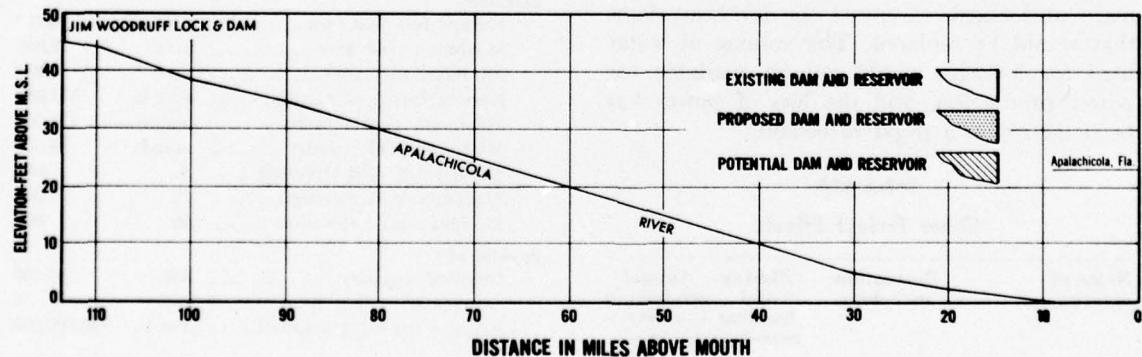
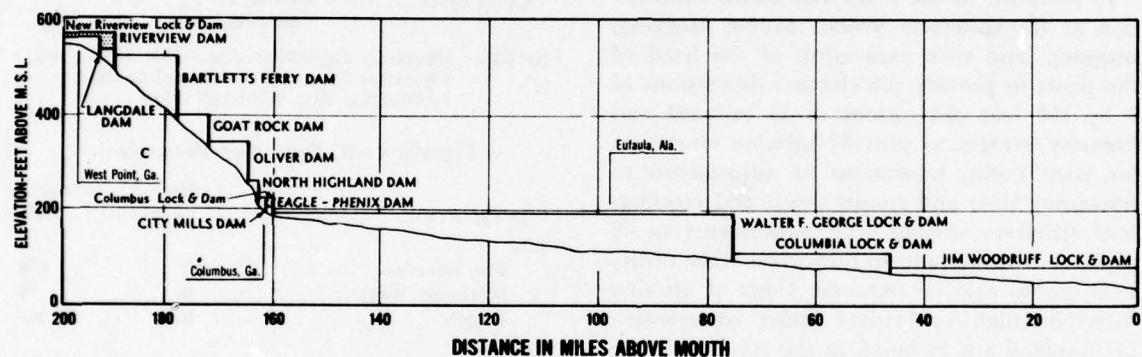
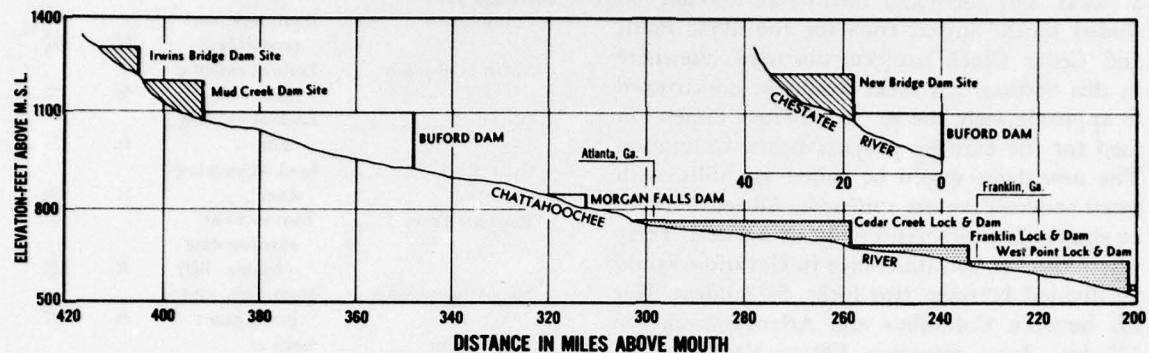


Figure 4.7

to development of the navigation system. The West Point and Cedar Creek dams would be constructed with provision of future installation of locks, but the locks themselves are not included in the initial costs for the West Point and Cedar Creek projects discussed elsewhere in this Section. All locks would be constructed to approximately the 82- by 450-foot dimension used for the existing projects below Columbus. The new dams would be rolled earthfills, with gated concrete gravity spillways. All locks would be single-lift structures, except at Bartletts Ferry where the 121-foot difference in elevation would be divided between two locks, in tandem. Net lift between Columbus and Atlanta would be 555 feet, from elevation 190 to elevation 745 mean sea level. Length of the waterway extension would be 135 miles.

In addition to the locks and dams, construction at the waterway would involve dredging, snagging, and rock excavation of the head of the pools to provide the channel dimensions of 9 by 100 feet. Alterations to 14 railroad and highway bridges to provide suitable clearances for river traffic, relocations or adjustments to numerous State and county roads and crossings over tributary streams, and adjustments to 12 pipeline crossings and to numerous other utility lines would also be required. Costs of altering interstate highway bridges under construction or proposed are included in the relocation estimate. Dock facilities are not included in the project.

Operation of existing power dams would remain unchanged, except at the low-head dams that would be replaced. The volume of water used for lockages would not be available for power production, and the loss of power has been treated as a negative benefit.

TABLE 4.20
Other Project Effects

Name of reservoir	Recreation user-days	Fishing and production hunting —electric user-days	Annual energy—(million kw.-hr.)
Franklin	400,000	22,800	105
New Riverview	*	10,000	115
Columbus	*	—	130

* Included in access areas.

Data

Locks and dams	Structure required	Unit	Average lift
Columbus ¹ ³	Dam, lock, and powerplant	ft.	34
North Highlands	Lock at existing dam	ft.	39
Oliver	Lock at existing dam	ft.	74
Goat Rock	Lock at existing dam	ft.	62
Bartletts Ferry	Two locks at existing dam (double lift)	ft.	121
New Riverview ² ³	Dam, lock, and powerplant	ft.	37
West Point	Lock at proposed dam	ft.	78
Franklin ³	Dam, lock, and powerplant	ft.	50
Cedar Creek	Lock at proposed dam	ft.	60

NOTES: ¹ Replaces Eagle-Phenix and City Mills dams.

² Replaces Riverview and Langdale dams.

³ Additional data tabulated below.

Franklin Lock, Dam, and Powerplant

	Unit	Amount
Drainage area	sq. mile	2,682
Dam		
Top elevation	ft.	698
Maximum height	ft.	88
Length	ft.	2,300
Spillway		
Crest elevation	ft.	657
Length	ft.	531
Discharge at pool elevation 690	c.f.s.	373,000
Reservoir		
Normal full pool area	acre	6,750
Maximum pool area	acre	8,800
Minimum pool area	acre	6,000
Normal full pool capacity	acre-ft.	118,000
Maximum pool capacity	acre-ft.	175,000
Minimum pool capacity	acre-ft.	98,000
Normal full pool elevation	ft.	685
Maximum pool elevation	ft.	692
Minimum pool elevation	ft.	682
Powerplant		
Installed capacity	kw.	50,000
Average operating head	ft.	50
Average annual generation	kw.-hr.	108,500,000

New Riverview Lock, Dam, and Powerplant

Drainage area	Unit	Amount
Drainage area	sq. mile	4,600
Dam		
Top elevation	ft.	575
Maximum height	ft.	60

	Unit	Amount
Length	ft.	2,500
Spillway		
Crest elevation	ft.	525
Length	ft.	600
Discharge	c.f.s.	375,000
Reservoir		
Normal full pool area	acre	3,000
Normal full pool capacity	acre-ft.	50,000
Normal full pool elevation	ft.	557
Maximum pool elevation	ft.	567
Minimum pool elevation	ft.	553
Powerplant		
Installed capacity	kw.	65,000
Average operating head	ft.	39
Average annual generation	kw-hr.	115,000,000
Columbus Dam, Lock and Powerplant		
Drainage area	sq. mile	4,640
Dam		
Top elevation	ft.	240
Maximum height	ft.	60
Length	ft.	2,500
Spillway		
Crest elevation	ft.	200
Length	ft.	600
Discharge	c.f.s.	375,000
Reservoir		
Normal full pool area	acre	1,000
Normal full pool capacity	acre-ft.	20,000
Normal full pool elevation	ft.	224
Maximum pool elevation	ft.	234
Minimum pool elevation	ft.	221
Powerplant		
Installed capacity	kw.	30,000
Average operating head	ft.	33
Average annual generation	kw-hr.	130,000,000

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Power	4,100
Recreation	875
Fish and wildlife	42
Navigation	9,173
Total	14,190

Impacts

The development of navigation to Atlanta would open up possibilities for new types of industries and other developments that are now not seriously considered for the area. Residents from metropolitan Atlanta and other areas along the watercourse would be able to take boats of cruiser size to open water in the Gulf of Mexico without portages. New docking and other facilities would be required to handle the waterborne

traffic. Power production included in the plan extends the benefits into the power field. The impacts of power production and other general aspects of the development are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Navigation facilities	0	218,000
Dams and reservoirs	0	40,900
Recreation facilities	0	2,050
Fish and wildlife facilities	0	50
Power facilities	0	47,700
Total	0	308,700
Annual Equivalent		
Investment		11,100
Operation, maintenance, and replacements		1,700
Taxes foregone		1,100
Total		13,900

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Power	69,200	*4,234	647	647
Recreation	4,930	320	142	144
Fish and wildlife	1,070	50	12	12
Navigation	233,500	9,296	899	900
Total	308,700	*13,900	1,700	1,700

* Includes \$1,100,000 for taxes foregone.

Special Considerations

The Franklin, New Riverview, and Columbus developments will probably be justifiable by the year 2000 for power, recreation, fish and wildlife, and other uses without consideration of their necessity as a part of the navigation system. Since they are not scheduled for development until near the end of the study period and since they are essential to completion of the navigation system, they have been included in the Middle Chattahoochee project. This should not preclude the development of one or more of the units as independent projects if future studies should show such a course to be desirable.

The water used for lockage would decrease energy production from the existing and proposed powerplants. The energy loss has been

considered in the calculation of benefits. Improved regulation provided by the system would probably offset the lockage losses, but this advantage has not been evaluated. Both private and public power developments will be affected

by the navigation installation, and mutually acceptable energy-exchange or other arrangements covering the entire system should be worked out prior to initiation of construction of any part of the navigation works.

COLUMBUS-PHENIX CITY PROJECT

Location

The project area is along the Chattahoochee River in the vicinity of Columbus, Georgia, and Phenix City, Alabama.

Plan

There is an acute shortage of naturally protected waterfront industrial sites in the Columbus-Phenix City area. High ground along the river to the head of the existing navigation channel has been developed for industrial, residential, and military use. If navigation is eventually extended to Atlanta or other areas north of Columbus, industrial development north of the cities will be possible. Extension of the present channel to these industrial site possibilities is precluded, however, by hydropower and other facilities that would make the cost of local development prohibitive. The only reasonable possibility for meeting the immediate needs for waterfront development sites appears to be landfills or levee protection of available sites south of Columbus and Phenix City.

Preliminary studies indicate that there are three general areas that appear to be worthy of development. The locations were selected on the basis of preliminary considerations of land needs and of the effect of the protection works on floodflows.

Area A is located on the left bank of the river between Columbus and Fort Benning, Georgia. It contains about 1,200 acres of undeveloped land that might be made available for industrial use. All of the area is subject to flooding. It contains deposits of sand, gravel, and clay that are being mined and used by local industries. The docking facilities for the city of Columbus are being constructed about 2 miles upstream from the area.

Area B is located below Phenix City, Alabama, where there are approximately 5,500 acres of

undeveloped land along the right bank flood plain. About 5,300 acres are subject to flooding. A part of this area is being developed to provide the initial docking facilities on the Phenix City side of the river. This area also contains deposits of sand, gravel, and clay of unknown extent that are being mined for local use.

Area C is located on relatively high ground along the right bank of the river opposite Fort Benning. It contains about 1,000 acres.

The levees and fills considered were designed with a 3-foot free-board over the recorded 1929 flood, which has about a 100-year frequency. Estimates were based on the assumption that fill material would come from the river side of the protective works and that the increased channel and future upstream control would prevent any increase in flood stage that might otherwise result from levee constructions.

No subsurface investigations were made and no boring logs are available. However, it has been noted that the water surface in the sand and gravel pits fluctuates with the water surface elevation of the river. It is possible that seepage under levees in this area might be extensive during flood stages when the head differential would be as much as 30 feet, so the cost of pumps to control possible seepage water was included in the estimates. Landowners in the protected areas will be among the principal beneficiaries so the cost of land to be improved is not included in the estimates.

Data

Preliminary estimates for the protection of Area A cover about 35,000 feet of dike averaging about 30 feet in height. Protection would be provided to a developed area in addition to the 1,200 acres that are undeveloped.

Area B could be protected by a levee 23,000 feet long with an average height of about 14

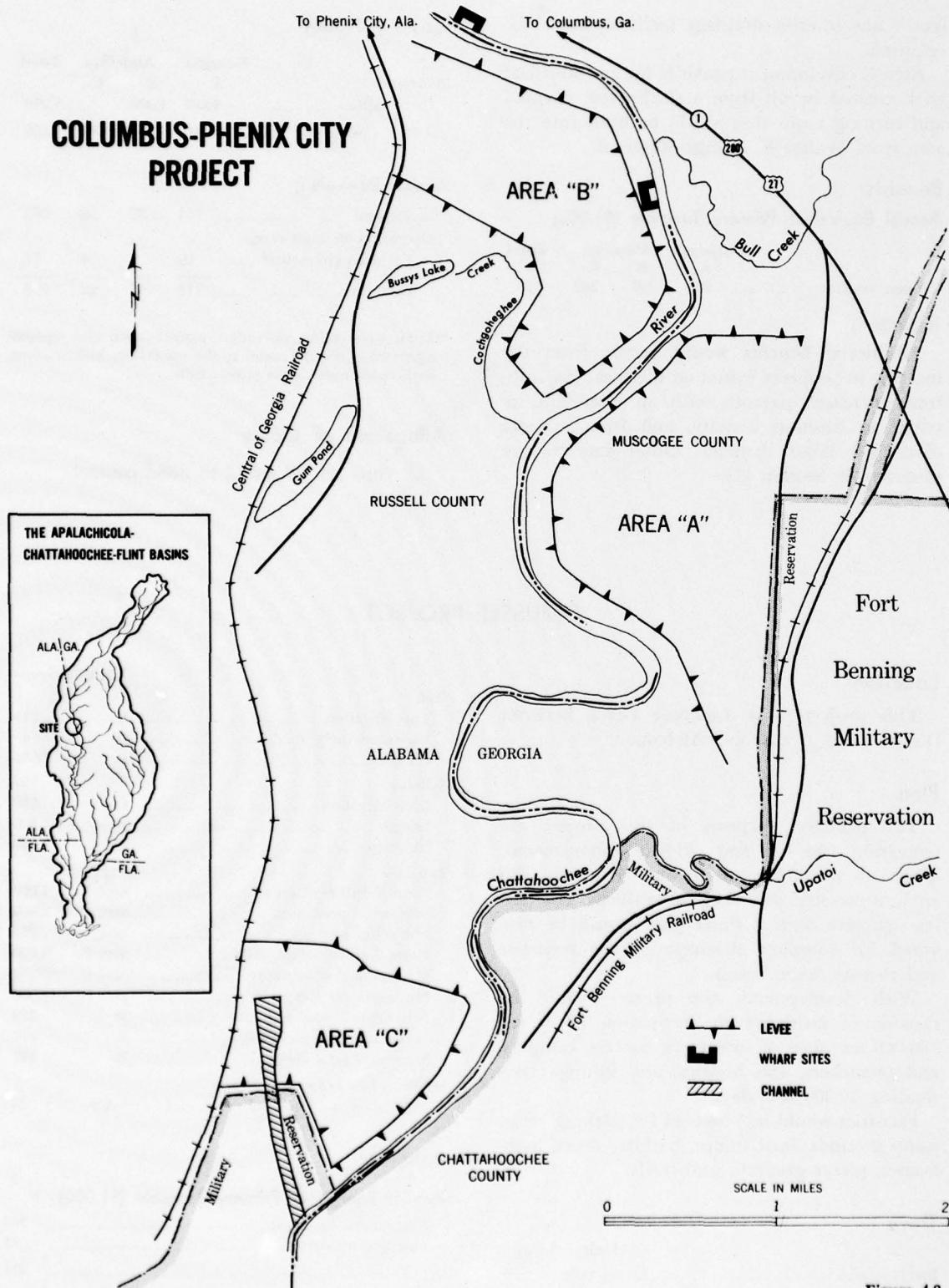


Figure 4.8

feet. Some interior drainage facilities would be required.

Area C development provides for an industrial park created by fill from a slack-water channel and turning basin that would be built into the area from Walter F. George Reservoir.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia A	Alabama B	Total C
Flood control	303	193	282

Impacts

Additional benefits would accrue from the increase in property values on the local tax rolls, from increased payrolls with an attendant increase in business activity, and from a more diversified labor demand. Other impacts are discussed in Section III.

Costs (\$1,000)

Investment	Georgia A	Alabama B	Total C
Early action	4,000	1,000	5,000
Total (1960-2000)	4,500	1,100	7,200

Annual Equivalent

Investment	163	39	58	260
Operation, maintenance, and replacements*	10	8	4	22
Total	173	47	62	282

* Annual equivalent operation, maintenance, and replacements costs are the same as the operation, maintenance, and replacements costs at year 2000.

Allocation of Costs

All costs are allocated to flood control.

OMUSSEE PROJECT

Location

This project is on Omussee Creek between Dothan and Columbia, Alabama.

Plan

The primary purposes of this project are recreation and fish and wildlife enhancement. The dam would be an earthfill structure with an uncontrolled side channel spillway. An outlet structure with a sluice gate would be provided for complete drainage of the reservoir and to vary water levels.

With development, the project would be capable of satisfying the recreation needs for 100,000 user-days of swimmers, boaters, campers, and picnickers, and hunting and fishing needs totaling 10,000 user-days.

Facilities would be provided for parking areas, camp grounds, boat ramps, bathing areas, bathhouses, picnic grounds, and trails.

Data

	Unit	Amount
Drainage area	sq. mile	50

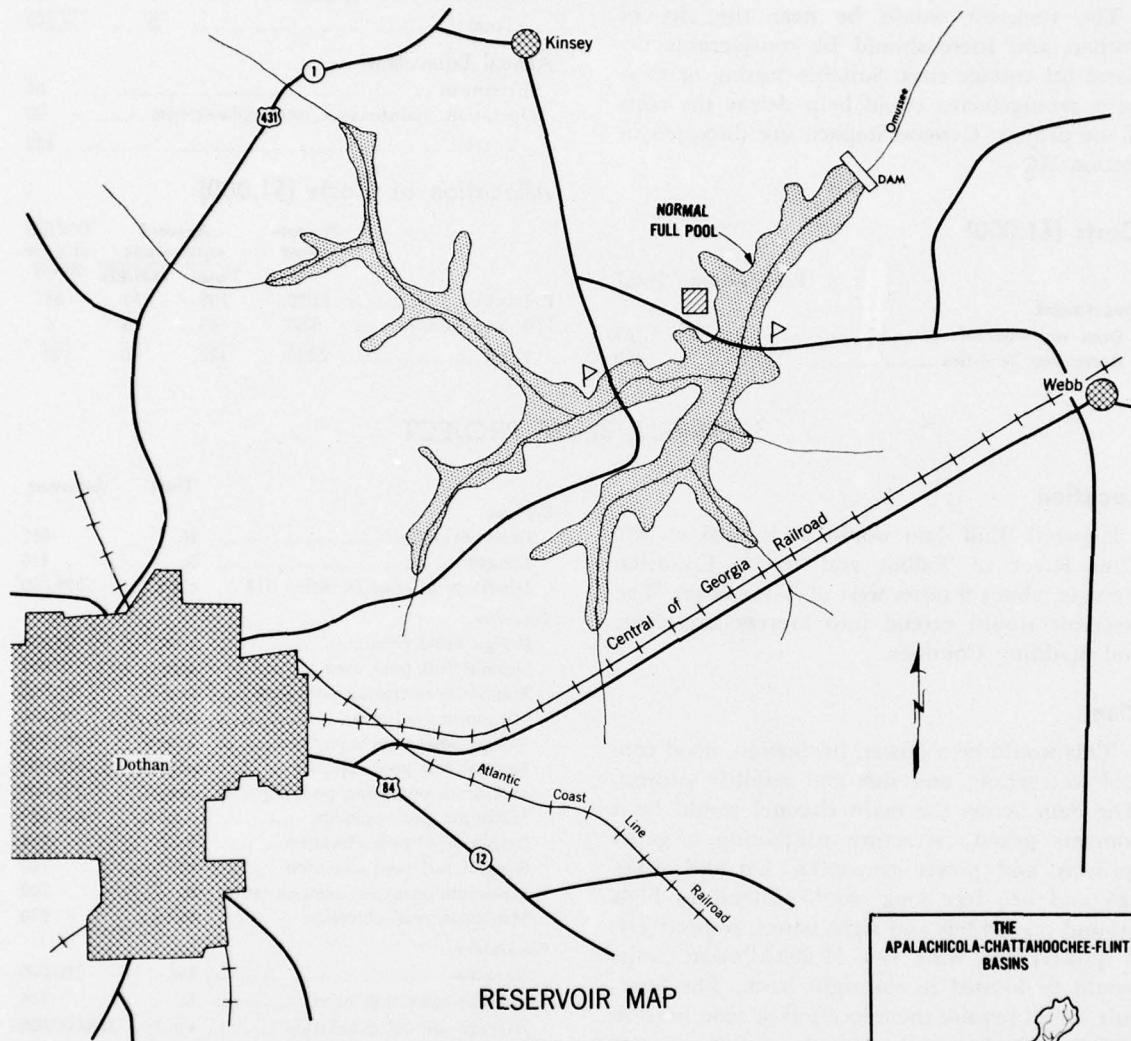
	Unit	Amount
Dam		
Top elevation	ft.	215
Maximum height	ft.	45
Length	ft.	3,500
Spillway		
Crest elevation	ft.	200
Length	ft.	300
Discharge	c. f. s.	25,000
Reservoir		
Normal full pool area	acre	1,000
Maximum pool area	acre	2,500
Minimum pool area	acre	750
Normal full pool capacity	acre-ft.	9,000
Maximum pool capacity	acre-ft.	30,000
Minimum pool capacity	acre-ft.	6,000
Normal full pool elevation	ft.	200
Maximum pool elevation	ft.	210
Minimum pool elevation	ft.	197
Minimum flow required in stream below dam	c. f. s.	20

Benefits

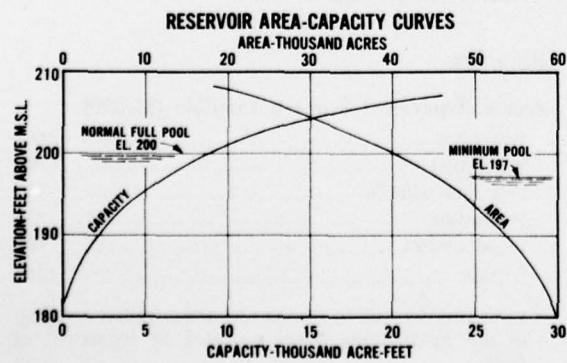
Annual Equivalent Primary Tangible (\$1,000)

Recreation	156
Fish and wildlife	15
Total	171

OMUSSEE PROJECT



SCALE IN MILES



▷ ACCESS AREA
■ RECREATION AREA



Figure 4.9

Impacts

The reservoir would be near the city of Dothan and there should be considerable demand for cottage sites. Suitable leasing or easement arrangements could help defray the costs of the project. General impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	0	1,785
Recreation facilities	0	450

	Early action	Total
Fish and wildlife facilities	0	15
Total	0	2,250

Annual Equivalent

Investment	81
Operation, maintenance, and replacements	40
Total	121

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent	OM&R at year 2000
	Total	OM&R	2000
Recreation	1,970	108	38
Fish and wildlife	280	13	4
Total	2,250	121	42

SPEWRELL BLUFF PROJECT

Location

Spewrell Bluff dam would be located on the Flint River in Talbot and Upson Counties, Georgia, about 9 miles west of Thomaston. The reservoir would extend into Meriwether, Pike, and Spalding Counties.

Plan

This would be a power, navigation, flood control, recreation, and fish and wildlife project. The dam across the main channel would be a concrete gravity structure containing a gated spillway and power penstocks. Earthfill dikes 125 and 625 feet long would extend to high ground on the left and right banks, respectively. A powerplant with two 50,000-kilowatt units would be located in the right bank. The reservoir would require the relocation or modification of 7 State highways, 2 railroads, and 26 miles of county roads.

Facilities would be provided for picnicking, swimming, boating, camping, and sightseeing to satisfy requirements for 800,000 user-days annually. An additional 74,600 user-days annually by fishermen and hunters are expected to materialize by the year 2000.

Data

	Unit	Amount
Drainage area	sq. mile	1,210
Dam		
Top elevation	ft.	722
Maximum height	ft.	180
Length	ft.	1,950

	Unit	Amount
Spillway		
Crest elevation	ft.	682
Length	ft.	440
Discharge at pool elevation 714	c. f. s.	269,000
Reservoir		
Design flood pool area	acre	26,000
Normal full pool area	acre	16,800
Maximum operating pool area	acre	23,000
Minimum pool area	acre	6,400
Design flood pool capacity	acre-ft.	760,000
Normal full pool capacity	acre-ft.	500,000
Maximum operating pool capacity	acre-ft.	730,000
Minimum pool capacity	acre-ft.	178,000
Design flood pool elevation	ft.	714
Normal full pool elevation	ft.	700
Maximum operating pool elevation	ft.	709
Minimum pool elevation	ft.	670
Powerplant		
Capacity	kw.	100,000
Average operating head	ft.	146
Average annual generation	kw.-hr.	133,000,000
Minimum flow required in stream below dam (after construction of Lazer Creek project)		
	c. f. s.	0

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Power	2,669
Recreation	1,322
Fish and wildlife	100
Navigation	*34
Flood control	667
Total	4,792

* Estimated decrease in annual cost of navigation dredging in the Apalachicola River provided by regulation of flows.

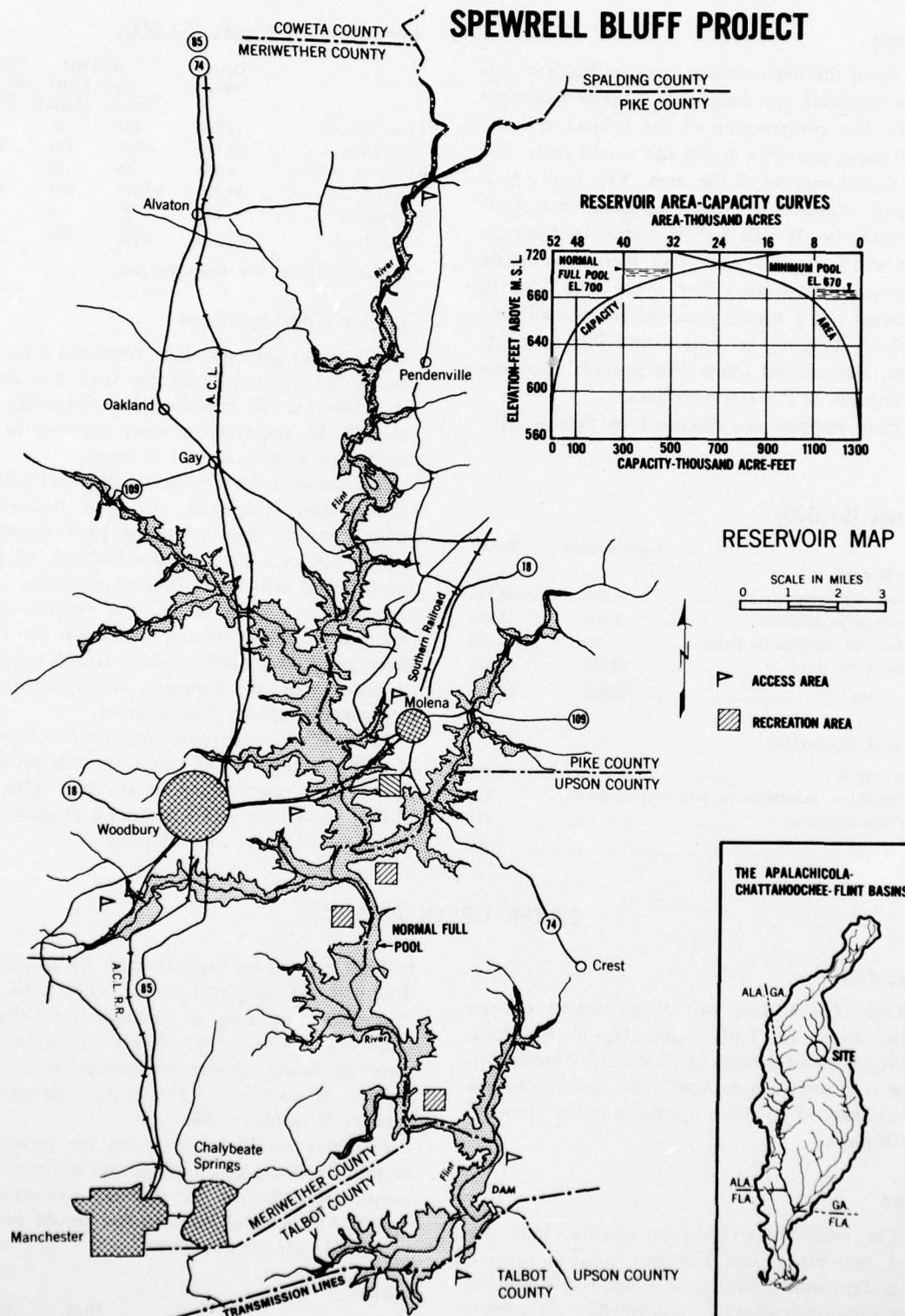


Figure 4.10

Impacts

Two of the five counties surrounding Spewell Bluff reservoir are designated as redevelopment areas. The construction of the project and the continuing activities at the site would help raise per capita income of the area. The reservoir is located within easy driving range of metropolitan Atlanta. It will be an attractive reservoir that will help serve Atlanta's recreation needs. Recreationists from other areas will also be attracted. As a result, nonresident expenditures for food, lodging, recreation and fishing equipment, and related items will provide economic advantages to the reservoir area.

Other impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	44,640	44,775
Recreation facilities	2,000	3,350
Fish and wildlife facilities	60	75
Power facilities	19,300	19,300
Total	66,000	67,500
Annual Equivalent		
Investment	2,411	
Operation, maintenance, and replacements	524	
Taxes foregone	770	
Total	3,705	

Allocation of Costs (\$1,000)

Invest- ment	Annual equivalent		OM&R at year 2000
	Total	OM&R	
Flood control	14,950	583	45
Recreation	10,100	519	173
Fish and wildlife	2,050	86	12
Power	39,700	*2,490	291
Navigation	700	27	3
Total	67,500	3,705	588

* Includes \$770,000 for taxes foregone.

Special Considerations

Preliminary geologic data, based on a limited amount of drilling, indicates that the site is acceptable for the intended use. Grouting will probably be required in some portions of the damsite to insure against leakage.

The Spewell Bluff project will provide benefits for many purposes, but it is basically a power project. The proposed plan could be carried out as a Federal, non-Federal, or joint development whichever is most desirable when construction is undertaken. The project operation will be closely related to that for the Lazer Creek and Lower Auchumpkee projects proposed for downstream development, and operating criteria should reflect that relation.

There is an opportunity for the development of pump storage at the site, using the proposed Lazer Creek reservoir as an afterbay. This possibility should be given thorough consideration before final plans are adopted.

LAZER CREEK PROJECT

Location

Lazer Creek dam would be located on the Flint River in Talbot and Upson Counties, Georgia, about 8 miles southwest of Thomaston. The reservoir at maximum power pool elevation would extend 7.7 miles upstream to the Spewell Bluff dam.

Plan

This would be a power, navigation, flood control, recreation, and fish and wildlife project. The dam would consist of a gated spillway 584 feet long with concrete nonoverflow abutments across the main channel. These would connect

to high ground on the left bank by an earthfill dike 670 feet long and on the right bank by a dike 1,450 feet long. A powerplant on the left bank would have two 43,500-kilowatt units. This reservoir would require the relocation or modification of portions of two State highways and 4 miles of county roads.

Facilities would be provided for picnicking, swimming, boating, camping, and sightseeing to satisfy requirements for 800,000 user-days annually. Fishing and hunting use would amount to 44,100 user-days in 2000.

Data

	Unit	Amount
Drainage area	sq. mile	1,410

LAZER CREEK PROJECT

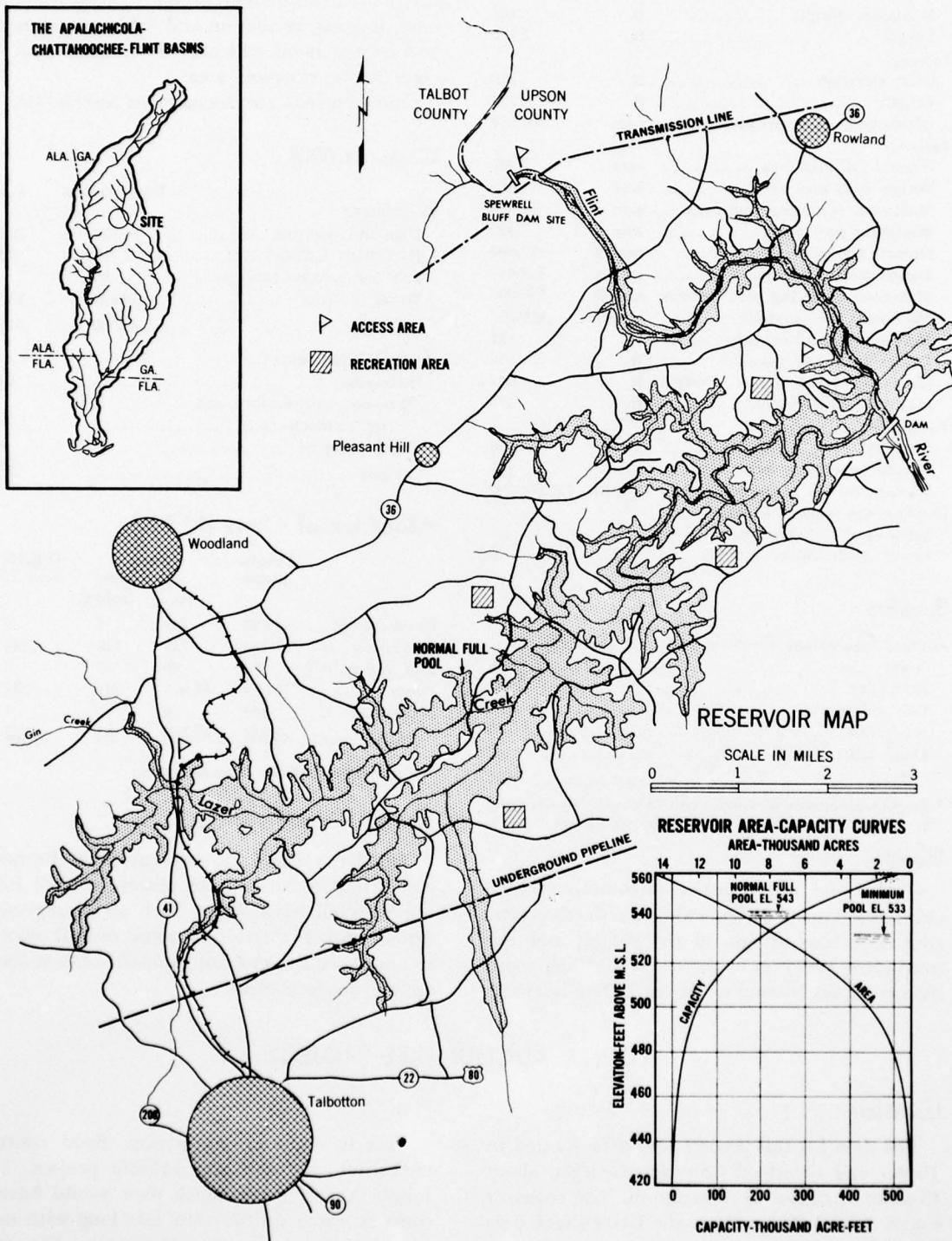


Figure 4.11

	Unit	Amount
Dam		
Top elevation	ft.	556
Maximum height	ft.	142
Length	ft.	3,420
Spillway		
Crest elevation	ft.	520
Length	ft.	584
Discharge at pool elevation 548	c.f.s.	301,000
Reservoir		
Normal full pool area	acre	9,900
Design flood pool area	acre	11,500
Maximum operating pool area	acre	11,000
Minimum pool area	acre	7,400
Normal full pool capacity	acre-ft.	297,000
Design flood pool capacity	acre-ft.	350,000
Maximum operating pool capacity	acre-ft.	342,000
Minimum pool capacity	acre-ft.	209,000
Normal full pool elevation	ft.	543
Design flood pool elevation	ft.	548
Maximum operating pool elevation	ft.	547
Minimum pool elevation	ft.	533
Powerplant		
Capacity	kw.	87,000
Average operating head	ft.	117
Average annual generation	kw-hr.	121,600,000
Minimum flow required in stream below dam (after construction of Lower Auchumpkee project)	c.f.s.	0

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Power	2,938
Recreation	1,322
Fish and wildlife	59
Navigation	*9
Flood control	82
Total	3,810

* Estimated decrease in annual cost of navigation dredging in the Aplachicola River provided by regulation of flows.

Impacts

One of the two counties surrounding Lazer Creek reservoir is designated as a redevelopment area. The construction of the project and the continuing activities at the site would help raise the per capita income of the area. The reservoir

is located within driving range of metropolitan Atlanta and will help serve Atlanta's recreation needs. As a result, nonresident expenditures for food, lodging, recreation and fishing equipment, and related items will provide economic advantages to the reservoir area.

Other impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	24,970	25,000
Recreation facilities	2,000	3,355
Fish and wildlife facilities	90	45
Power facilities	16,500	16,500
Total	43,500	44,900
Annual Equivalent		
Investment		1,605
Operation, maintenance, and replacements		429
Taxes foregone		670
Total		2,704

Allocation of Costs (\$1,000)

Invest- ment	Annual equivalent	OM&R at year 2000	
		Total	OM&R
Flood control	1,660	63	3
Recreation	11,700	583	179
Fish and wildlife	900	38	5
Power	30,500	2,014	241
Navigation	140	6	1
Total	44,900	2,704	494

* Includes \$670,000 for taxes foregone.

Special Considerations

The Lazer Creek powerplant could be operated semiautomatically by remote control from the Spewell Bluff plant. Such an arrangement would probably result in some overall savings in annual equivalent cost. Amounts shown above are for onsite control.

LOWER AUCHUMPKEE PROJECT

Location

The dam for this project would be located in Taylor and Crawford Counties, Georgia, about 18 miles southeast of Thomaston. The reservoir would extend 22.3 miles to the Lazer Creek dam in Talbot and Upson Counties.

Plan

This is a power, navigation, flood control, recreation, and fish and wildlife project. The Lower Auchumpkee Creek dam would have a concrete gated spillway 392 feet long with non-overflow abutments extending across the river

LOWER AUCHUMPKEE CREEK PROJECT

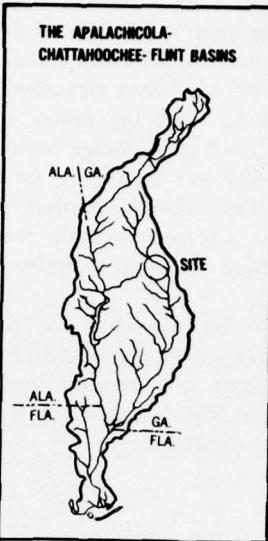
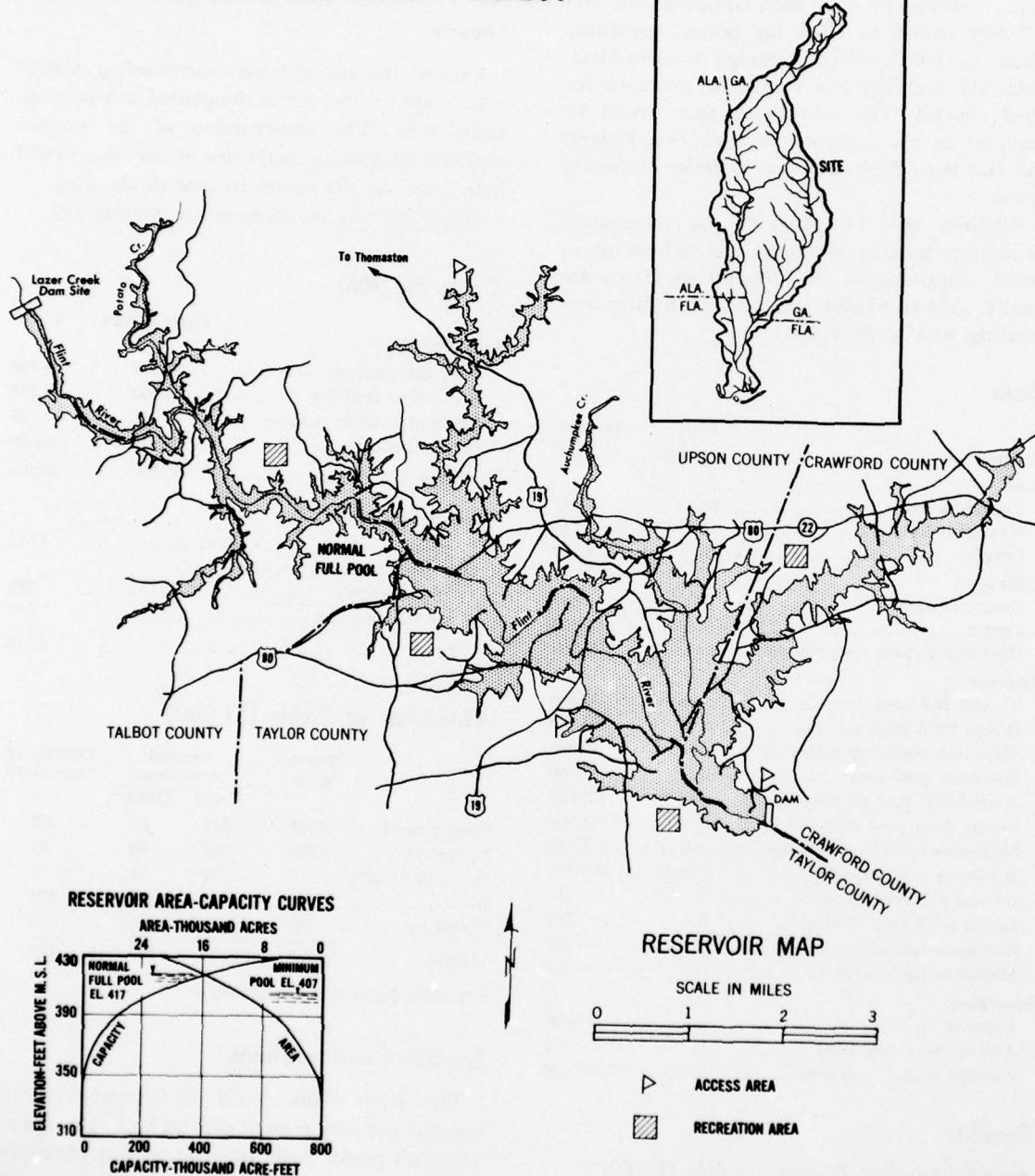


Figure 4.12

channel. These would be connected to high ground by an earthfill dike 3,400 feet long on the left bank and a dike 500 feet long on the right bank. The powerplant would be located in the right abutment. About 182,000 acre-feet of the reservoir pool between elevations 402 and 417 feet would be used for power operation. About 120,000 acre-feet of storage between elevations 417 and 425 feet would be provided for flood control. The relocations that would be required in this reservoir include two Federal and two State highways and 13 miles of county roads.

Facilities will be provided for picnicking, swimming, boating, camping, and sightseeing to satisfy requirements for 300,000 user-days annually. About 61,200 user-days of fishing and hunting will be provided.

Data

	Unit	Amount
Drainage area	sq. mile	1,970
Dam		
Top elevation	ft.	447
Maximum height	ft.	130
Length	ft.	4,920
Spillway		
Crest elevation	ft.	397
Length	ft.	392
Discharge at pool elevation 439	c.f.s.	389,000
Reservoir		
Normal full pool area	acre	15,600
Design flood pool area	acre	24,000
Maximum operating pool area	acre	19,000
Minimum pool area	acre	11,400
Normal full pool capacity	acre-ft.	403,000
Design flood pool capacity	acre-ft.	750,000
Maximum operating pool capacity	acre-ft.	548,000
Minimum pool capacity	acre-ft.	268,000
Normal full pool elevation	ft.	417
Design flood pool elevation	ft.	439
Maximum operating pool elevation	ft.	425
Minimum pool elevation	ft.	407
Powerplant		
Capacity	kw.	81,000
Average operating head	ft.	82
Average annual generation	kw.-hr.	122,800,000

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Power	2,203
Recreation	555
Fish and wildlife	80

Navigation	•15
Flood control	380
Total	3,233

* Estimated decrease in annual cost of navigation dredging in the Apalachicola River provided by regulation of flows.

Impacts

One of the two counties surrounding Lower Auchumpkee reservoir is designated a redevelopment area. The construction of the project and the continuing activities at the site would help raise the per capita income of the area.

Other impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	31,955	32,440
Recreation facilities	1,000	1,200
Fish and wildlife facilities	45	60
Power facilities	16,500	16,500
Total	49,500	50,200
Annual Equivalent		
Investment		1,813
Operation, maintenance, and replacements		382
Taxes foregone		624
Total		2,819

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Flood control	8,700	343	29	29
Recreation	5,600	280	80	93
Fish and wildlife	1,700	72	11	11
Power	33,900	*2,110	260	260
Navigation	300	14	2	2
Total	50,200	*2,819	382	395

* Includes \$624,000 for taxes foregone.

Special Considerations

The powerplant could be operated semi-automatically by remote control from the Spurwells Bluff plant. Such an arrangement probably would result in some saving in overall annual equivalent cost. Amounts shown above reflect onsite control.

LOWER FLINT PROJECT

Location

The Lower Flint project covers the section of the Flint River between the backwaters of Jim Woodruff Reservoir near Bainbridge, Georgia, and the head of proposed navigation at Albany, Georgia. Major structures of the project are the Raccoon Creek lock and dam in Baker and Mitchell Counties, about 15 miles south of Albany, and the Lower Vada lock and dam in Decatur County, about 10 miles north of Bainbridge.

Plan

The present head of navigation for the 9- by 100-foot project in the Flint River is at Bainbridge, Georgia, mile 29.1. The distance from Bainbridge to Albany is 75 river miles; and the fall is 76 feet, between elevation 153 feet at Albany and 77 feet at Bainbridge, the normal pool elevation of Jim Woodruff Reservoir.

Studies of streamflow records and of regulated flow from proposed storage reservoirs in the headwaters indicate that it would be impracticable to extend the 9-foot channel from Bainbridge to Albany by open-river methods. Studies made by the Corps of Engineers in connection with a recently completed survey report concluded that the most practicable plan of improvement would consist of construction of two locks and dams plus channel rectification to provide suitable alignment for barge traffic. The locks would be constructed at the Lower Vada and Raccoon Creek sites.

The dams would be rolled earthfills with concrete-gravity, gated spillways. Locks would have clear inside chamber dimensions of 82 by 450

feet, similar to the Jim Woodruff Lock. The Lower Vada project would be at river mile 43.4, about 10 miles north of Bainbridge. Lift at this site would be 49 feet, from 77 to 126 feet. The Raccoon Creek project site is located at river mile 79.9, about 15 miles south of Albany. Maximum lift would be 27 feet, between elevations 126 and 153 feet.

The Coastal Plain in which the Lower Vada and Raccoon Creek sites are located is a region of moderate relief which contains some areas that are nearly flat. Both sites and the upstream reservoir areas are underlain by Ocala limestone, which is soft, friable, and highly porous. The limestone is overlain by alluvial and residual sands. The cavernous nature of this formation indicates that reservoir leakage at both sites would be a major problem.

Relocation or modification of two highway and two railroad bridges across the river would be required to provide suitable openings for navigation. High level bridges would be necessary for U. S. Highway No. 84 at Bainbridge and Georgia Highway No. 37 at Newton. Alteration of the existing Seaboard Air Line and Atlantic Coast Line Railroad bridges, both swing spans, would be required to provide the 200-foot horizontal clearance considered essential for barge traffic. Relocation of about 5 miles of State highways in the Lower Vada pool would be necessary. Other utility relocations would be minor.

Two 14,000-kilowatt units would be installed in a powerplant located in the right bank of the Lower Vada project. This power installation

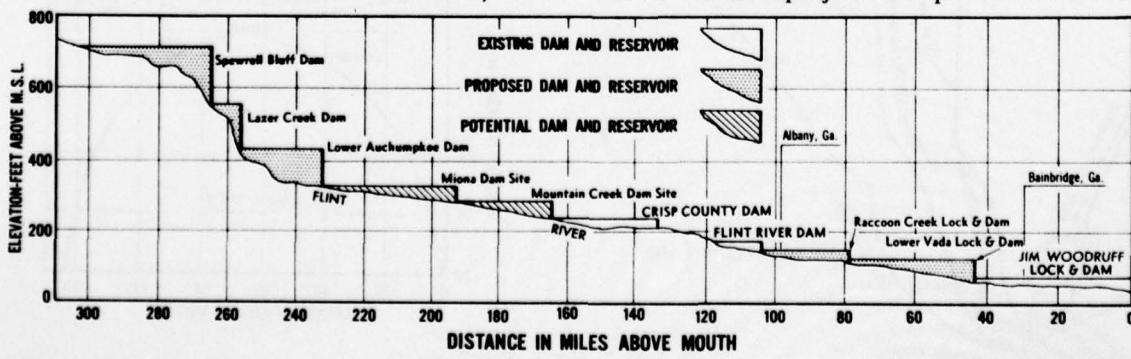


Figure 4.13 Profile of Flint River.

LOWER FLINT PROJECT

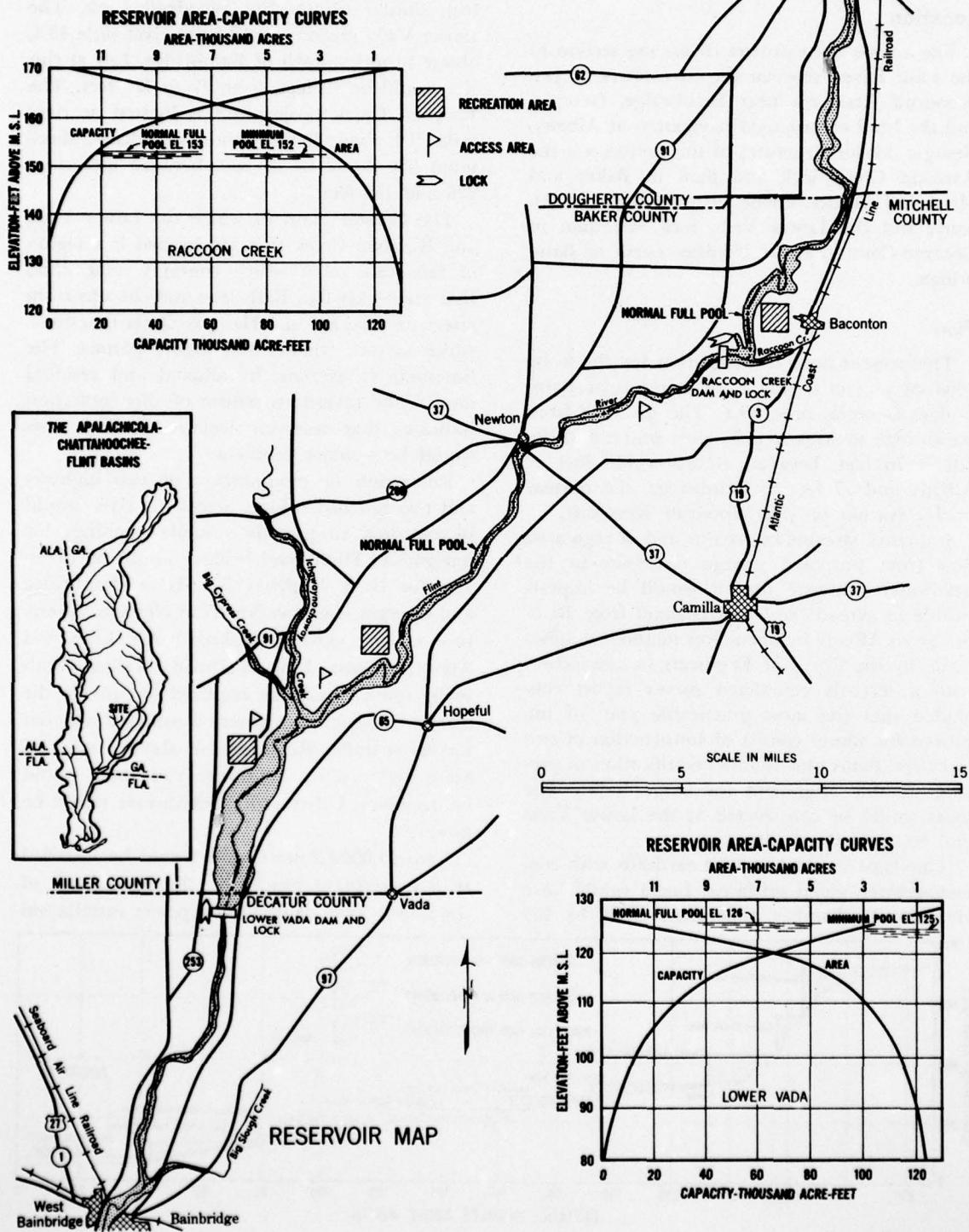


Figure 4.14

could be provided in cooperation with navigation only if the sites in the Fall Line reach were installed to provide dependable river flow.

The project would provide 250,000 user-days of general recreation and 113,000 user-days of hunting and fishing by the year 2000.

Data

Raccoon Creek Lock and Dam

The primary purposes of this dam are navigation, recreation, and fish and wildlife.

The dam would consist of an earthfill overflow dike from high ground to the lock and mound in the left bank; a gated spillway across the river channel; and an earthfill overflow dike extending to high ground on the right bank. No State or Federal highways or county roads would be affected.

	Unit	Amount
Drainage area	sq. mile	5,570
Dam		
Top elevation	ft.	160
Maximum height	ft.	58
Length	ft.	2,150
Spillway		
Crest elevation	ft.	133
Length	ft.	536
Discharge at pool elevation 173	c. f. s.	328,000
Reservoir		
Normal full pool area	acre	2,900
Design flood pool area	acre	14,000
Maximum operating pool area	acre	2,900
Minimum pool area	acre	2,500
Normal full pool capacity	acre-ft.	20,000
Design flood pool capacity	acre-ft.	150,000
Maximum operating pool capacity	acre-ft.	20,000
Minimum pool capacity	acre-ft.	19,000
Normal full pool elevation	ft.	153
Design flood pool elevation	ft.	173
Maximum operating pool elevation	ft.	153
Minimum pool elevation	ft.	152
Lock		
Clear inside dimensions	ft.	82 x 450
Maximum lift	ft.	27

Lower Vada Lock, Dam, and Powerplant

Navigation, power, recreation, and fish and wildlife are the primary purposes of this dam and reservoir. The principal features include an earthfill overflow dike from high ground to the lock and mound in the left bank; a gated spillway across the river channel; a powerplant intake section; and an earth dike to high ground on the right bank. The powerplant would be

located in the right bank. Necessary relocations consist of four State highways, one of which is a main stream crossing, and one county road. Downstream from the dam one Federal highway crossing and two railroad bridges at Bainbridge would have to be replaced or modified for navigation.

	Unit	Amount
Drainage area	sq. mile	7,110
Dam		
Top elevation	ft.	135
Maximum height	ft.	70
Length	ft.	3,630
Spillway		
Crest elevation	ft.	92
Length	ft.	680
Discharge at pool elevation 134	c. f. s.	379,000
Reservoir		
Normal full pool area	acre	12,800
Design flood pool area	acre	17,000
Maximum operating pool area	acre	12,800
Minimum pool area	acre	11,200
Normal full pool capacity	acre-ft.	117,000
Design flood pool capacity	acre-ft.	200,000
Maximum operating pool capacity	acre-ft.	117,000
Minimum pool capacity	acre-ft.	106,000
Normal full pool elevation	ft.	126
Design flood pool elevation	ft.	134
Maximum operating pool elevation	ft.	126
Minimum pool elevation	ft.	125
Powerplant		
Capacity	kw.	28,000
Average operating head	ft.	44
Average annual generation	kw.-hr.	167,000,000
Lock		
Clear inside dimensions	ft.	82 x 450
Maximum lift	ft.	49

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Power	1,098
Recreation	465
Fish and wildlife	161
Navigation	1,442
Total	3,166

Impacts

The Lower Vada and Raccoon Creek developments are designed primarily for navigation and power. There will also be benefits for recreation and fishing.

These two projects would, in addition, have impacts from increased land values and construction activity. The increase in land values on the area immediately surrounding the two res-

ervoirs would be of great benefit to the counties involved. The increased employment from the dam and reservoir construction activity, plus the construction of vacation homes on the reservoirs, will have an economic impact. All of these impacts would benefit Dougherty and Baker Counties, both of which have been designated redevelopment areas under the Area Redevelopment Program.

Other impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Raccoon Creek dam and reservoir	0	11,150
Lower Vada dam and reservoir	0	23,400
Recreation facilities	0	1,270
Fish and wildlife facilities	0	120
Power facilities	0	9,060

	Early action	Total
Navigation facilities	0	21,800
Total	0	66,800

Annual Equivalent

Investment	2,413
Operation, maintenance, and replacements	557
Taxes foregone	216
Total	3,186

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent	OM&R at year 2000
		Total OM&R	
Recreation	5,550	295	94
Fish and wildlife	3,750	161	26
Power	19,650	*1,098	172
Navigation	37,850	1,632	265
Total	66,800	3,186	557
			560

* Includes \$216,000 for taxes foregone.

MUCKALEE PROJECT

Location

Muckalee damsite is located on Muckalee Creek about 12 miles northwest of Americus in Schley County, Georgia.

Plan

The proposed project would provide benefits for flood control, recreation, fish and wildlife, and water supply. The reservoir at this location would regulate the runoff from about 12 percent of the drainage basin. The dam would be an earthfill type. The spillways would be located in the vicinity of the left abutment and controlled by 3 gates 40 by 28 feet. Storage of this reservoir would lower flood stages along Muckalee Creek about 3 feet in the vicinity of Americus and about 1 foot near the mouth. It would also augment the water supply of Americus. The area which would be inundated is mostly wooded and relocations would be minor. Access routes and sites would be provided for recreation and fishing and hunting. The facilities would be for fishing, picnicking, swimming, boating, camping, and sightseeing to satisfy the requirements for 100,000 recreation user-days annually and an increase of 6,400 user-days of fishing and hunting.

Data

	Unit	Amount
Drainage area	sq. mile	52
Dam		
Top elevation	ft.	450
Maximum height	ft.	45
Length	ft.	4,700
Spillway		
Crest elevation	ft.	420
Length	ft.	126
Discharge	c. f. s.	30,000
Reservoir		
Normal full pool area	acre	1,200
Maximum pool area	acre	1,900
Minimum pool area	acre	900
Normal full pool capacity	acre-ft.	14,000
Maximum pool capacity	acre-ft.	28,000
Minimum pool capacity	acre-ft.	7,000
Normal full pool elevation	ft.	437
Maximum pool elevation	ft.	445
Minimum pool elevation	ft.	431
Minimum flow required in stream below dam	c. f. s.	20

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Recreation	156
Fish and wildlife	8
Water supply	87
Flood control	45
Total	296

MUCKALEE CREEK PROJECT

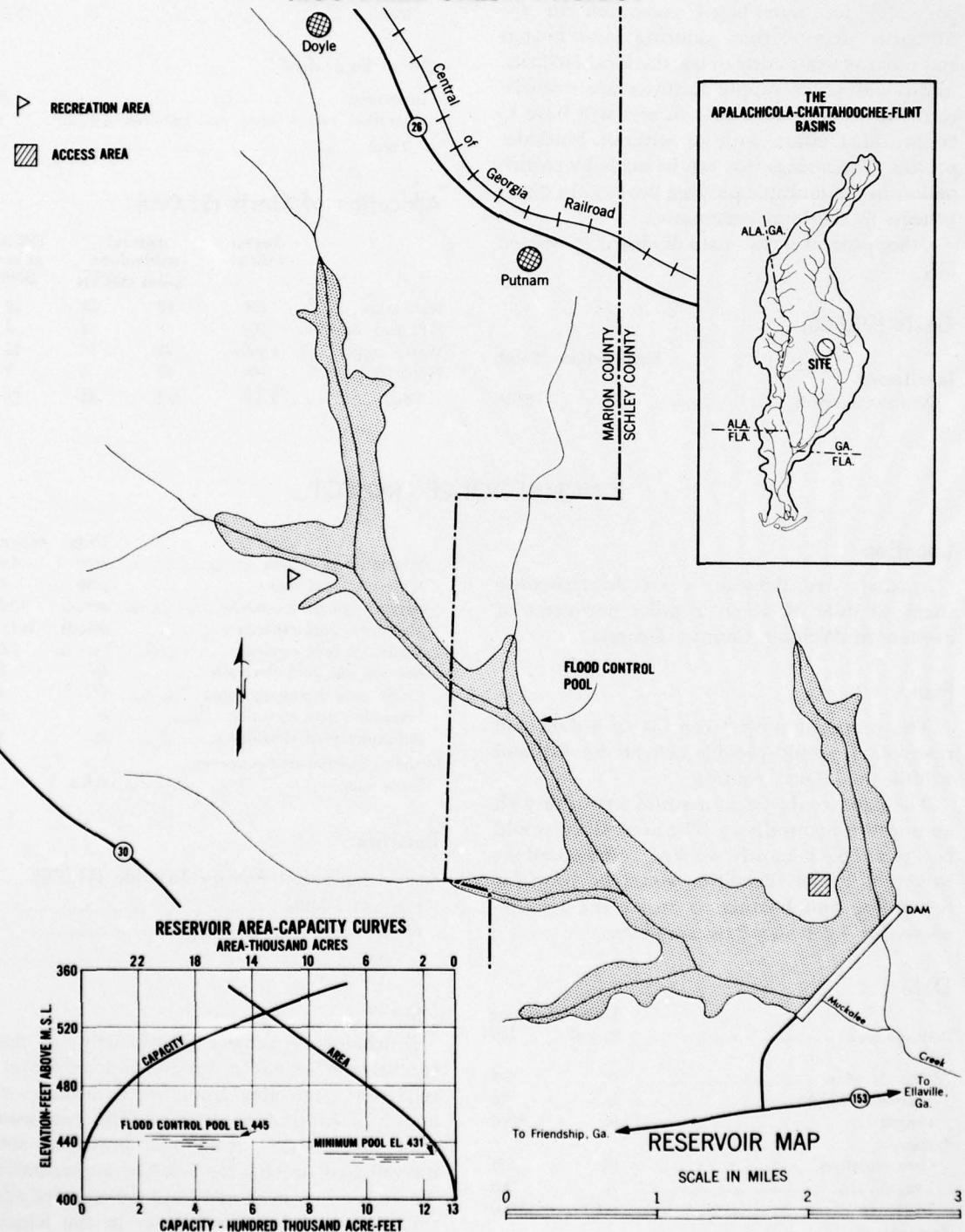


Figure 4.15

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UNITED STATES STUDY COMMISSION SOUTHEAST RIVER BASINS--ETC F/G 8/6
PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOU--ETC(U)
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Impacts

Muckalee reservoir will provide a needed opportunity for water-based recreation in the Americus vicinity, thus inducing local boaters and other recreationists to use the local facilities. Additional water supply facilities are essential to the areas continued growth and will have to be provided either with or without Muckalee project. The savings that can be made by participation in the multiple-purpose project are direct benefits to the local community.

Other general impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		

Dam and reservoir 0 2,935

	Early action	Total
Recreation facilities	0	450
Fish and wildlife facilities	0	15
Total	0	3,400

Annual Equivalent

Investment	124
Operation, maintenance, and replacements	57
Total	181

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent	OM&R at year 2000
		Total OM&R	
Recreation	800	62	32
Fish and wildlife	200	8	1
Water supply	1,500	72	18
Flood control	900	39	7
Total	3,400	181	58

KINCHAFOONEE PROJECT

Location

Kinchafoonee damsite is on Kinchafoonee Creek at mile 53 about 2 miles northwest of Preston in Webster County, Georgia.

Plan

The proposed project consists of a dam and reservoir. It would provide benefits for fish and wildlife and flood control.

The dam would be an earthfill structure with an uncontrolled spillway. The area which would be inundated is mostly wooded and relocations would be minor. Facilities would be provided for fishing and boating to satisfy the requirements for 4,200 user-days annually.

Data

	Unit	Amount
Drainage area	sq. mile	159
Dam		
Top elevation	ft.	435
Maximum height	ft.	70
Length	ft.	3,906
Spillway		
Crest elevation	ft.	395
Length	ft.	200
Discharge	c. f. s.	45,000
Reservoir		
Normal full pool area	acre	1,200

	Unit	Amount
Maximum pool area	acre	4,400
Minimum pool area	acre	600
Normal full pool capacity	acre-ft.	10,000
Maximum pool capacity	acre-ft.	105,000
Minimum pool capacity	acre-ft.	5,000
Normal full pool elevation	ft.	395
Flood control pool elevation	ft.	425
Maximum pool elevation	ft.	430
Minimum pool elevation	ft.	385
Minimum flow required in stream below dam	c. f. s.	10

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Fish and wildlife	6
Flood control	80
Total	86

Impacts

Kinchafoonee project is primarily for flood control and its effects would be spread over a relatively large area from the damsite to the mouth of Kinchafoonee Creek. The dam would tend to stabilize streamflows, providing some unevaluated benefits for low-flow augmentation. There is also a need and local demand for additional recreational opportunity in the Kinchafoonee area. The reservoir, as planned, has an

KINCHAFOONIE CREEK PROJECT

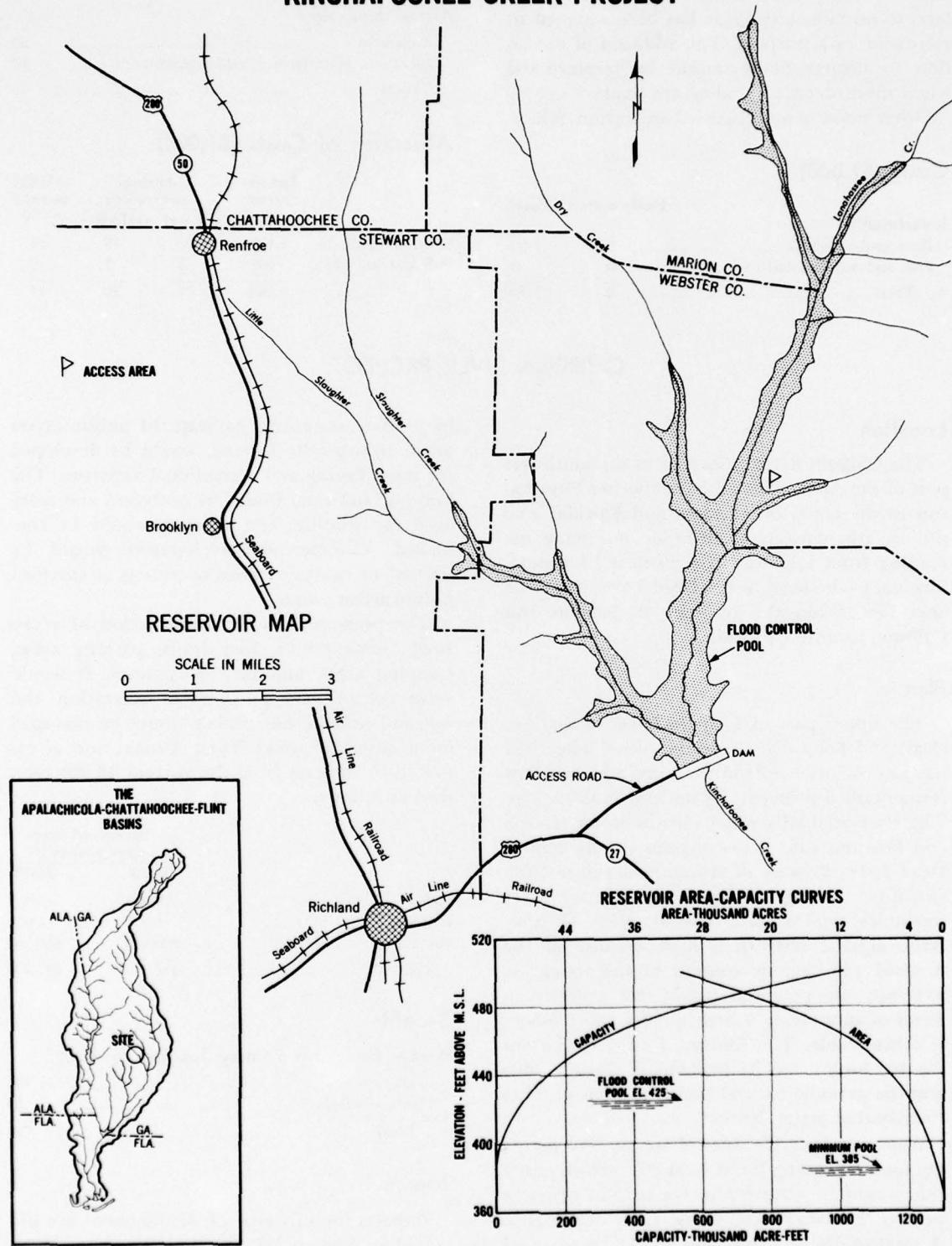


Figure 4.16

extraordinarily wide fluctuation in water surface, so no monetary value has been assigned to recreation as a purpose. The addition of recreation to project plans should be reconsidered when more detailed studies are made.

Other impacts are discussed in Section III.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	0	1,485
Fish and wildlife facilities	0	15
Total	0	1,500

	Total
Annual Equivalent	
Investment	55
Operation, maintenance, and replacements	20
Total	75

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent	OM&R at year 2000
	Total	OM&R	
Flood control	1,400	70	19
Fish and wildlife	100	5	1
Total	1,500	75	20
			21

CHIPOLA RIVER PROJECT

Location

The Chipola River is located in the southwest part of the Apalachicola-Chattahoochee-Flint basins in the States of Alabama and Florida. The project area consists of 80 miles of streams extending from Highway No. 90 near Marianna, Florida, to the head of the Dead Lake area. The area lies within the confines of Jackson and Calhoun Counties, Florida.

Plan

The upper part of Chipola River is shallow, clear, and flows over limestone beds. The river has a substantial upland drainage area but flow is maintained primarily by underground springs. The river gradually widens in the lower reaches and fans out into a vast cypress swamp named Dead Lake. Because of tributary drainage from swampland along the lower reaches, the river resembles typical dark coastal plain streams. Basic aquatic fertility is high because of the mineral and organic content of the water. As a result, the potential productive capacity in terms of supporting a high quality sport fishery is considerable. The limiting factors in current use for fishing are its inadequate access points and the periodic natural changes which produce unfavorable water levels.

Approximately 80 miles of stream and marginal land extending for at least 300 feet on either side would be acquired in fee title in order to protect the natural and scenic value of the area. A total of about 8,000 acres would be required

in public ownership. At least 10 public access areas, strategically located, would be developed for sport fishing and recreational activities. The bottom land zone would be protected and managed for wildlife, and hunting would be controlled. Commercial development would be limited to concessionaries operating at specified public access points.

The proposal includes construction of access roads, vista points, foot trails, parking areas, camping areas, and related facilities. It would serve the primary purposes of recreation and fish and wildlife but timber would be managed on a sustained yield basis. Annual use is expected to increase from the current 16,000 user-days as follows:

	Increased user- days annually	
	1975	2000
Fishing	10,000	10,000
Hunting	1,000	1,000
Recreation	300,000	600,000
Total	311,000	611,000

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Recreation	755
Fish and wildlife	33
Total	788

Impacts

Impacts for this type of development are discussed in Section III.

DIAGRAM OF CHIPOLA RIVER PRESERVATION AREA PROJECT

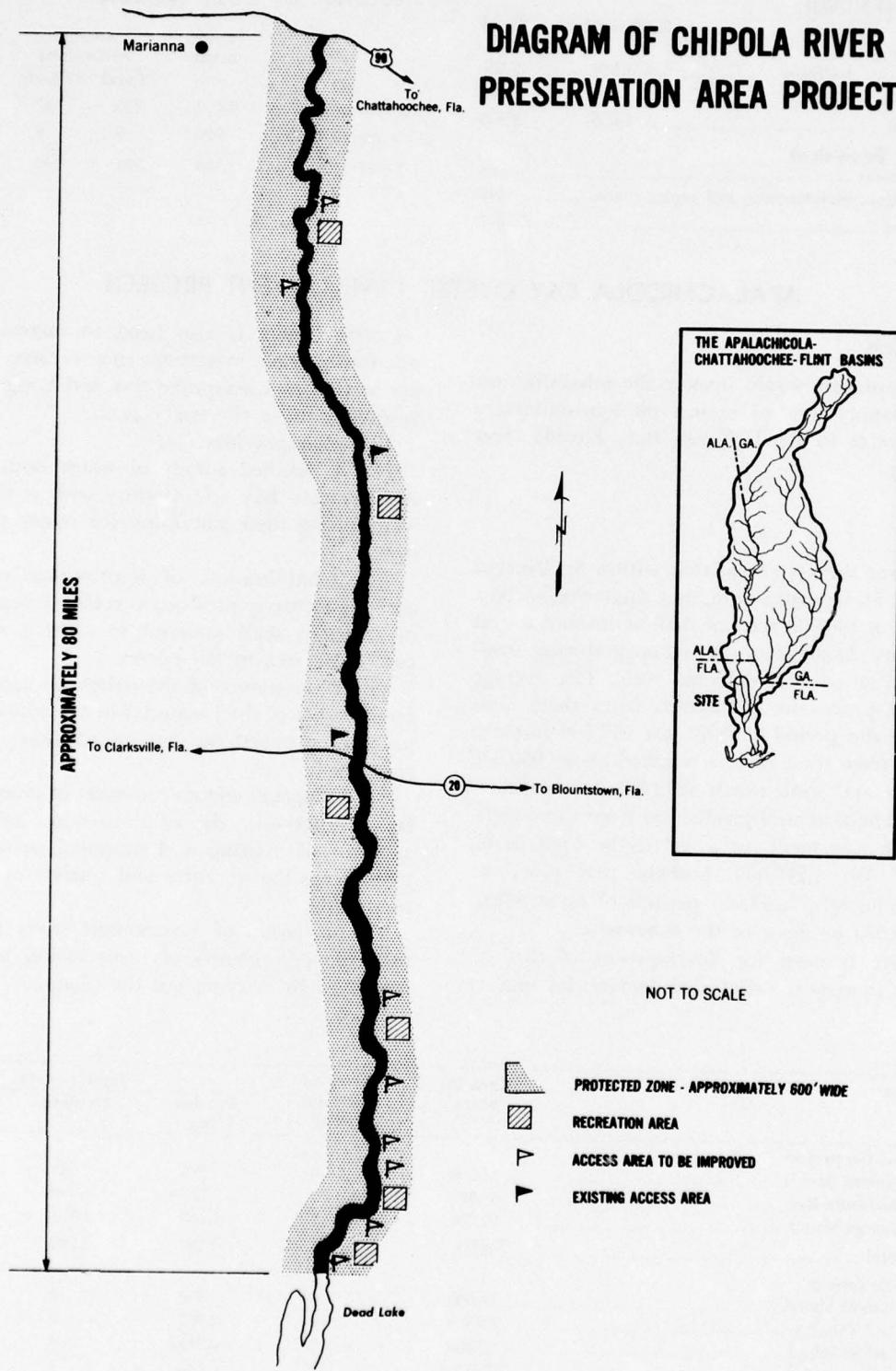


Figure 4.17

Costs (\$1,000)

	Early action	Total
Investment		
Recreation facilities	1,500	2,500
Land and access	300	600
Total	1,800	3,100
Annual Equivalent		
Investment	93	
Operation, maintenance, and replacements	149	
Total	242	

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	2,600	233	141	184
Fish and wildlife	500	9	8	8
Total	3,100	242	149	192

APALACHICOLA BAY OYSTER DEVELOPMENT PROJECT

Location

This project would involve the rehabilitation and management of oysters on approximately 6,050 acres in Apalachicola Bay, Florida, and vicinity.

Plan

Recent surveys reveal that within St. Vincent Sound, St. George Sound, and Apalachicola Bay, a total of 166,900 acres of shallow inshore waters contains 2,350 acres of oyster-producing reefs and 3,700 acres of depleted reefs. The average annual production of oysters from these reefs during the period 1955-59 was 218,390 bushels. Yields from these oysters weighed about 950,000 pounds and were worth \$272,000 to the fisherman. The potential production from these reefs, with management at a relatively high level, would be 1,210,000 bushels per year, or approximately 5,263,000 pounds of meat worth \$1,579,000 or more to the fishermen.

There is need for development of this resource to meet the projected demand for quality

seafoods. There is also need to increase production of these oysterbeds to overcome loss of production in Chesapeake Bay and Long Island Sounds, outside the study area.

The plan provides for:

(1) A detailed survey of water bottoms in Apalachicola Bay and vicinity with a view toward rating their suitability for oyster production.

(2) Rehabilitation of approximately 3,700 acres of formerly productive reefs by deposition of sufficient shell material to form a suitable cultch for seeding of oysters.

(3) Maintenance of the cultch by annual replenishment of shell material in accordance with practices specified by the conservation agencies concerned.

(4) Adoption and enforcement of sound regulations governing the administration and management of existing and proposed oyster reefs to increase the quantity and quality of oysters produced.

(5) Initiation of a systematic study to evaluate the effectiveness of conservation practices employed in carrying out the plan.

Data

Project	Area in acres	Extent of pollution (acre)	Oyster reefs		
			Produc- ing	Depleted	Total
Without the project					
St. Vincent Sound	13,500	0	525	425	950
Apalachicola Bay	60,800	20,900	725	1,600	2,325
St. George Sound	92,600	0	1,100	1,675	2,775
Total	166,900	20,900	2,350	3,700	6,050
With the project					
St. Vincent Sound	13,500	0	950	0	950
Apalachicola Bay	60,800	0	2,325	0	2,325
St. George Sound	92,600	0	2,775	0	2,775
Total	166,900	0	6,050	0	6,050

APALACHICOLA BAY OYSTER DEVELOPMENT PROJECT

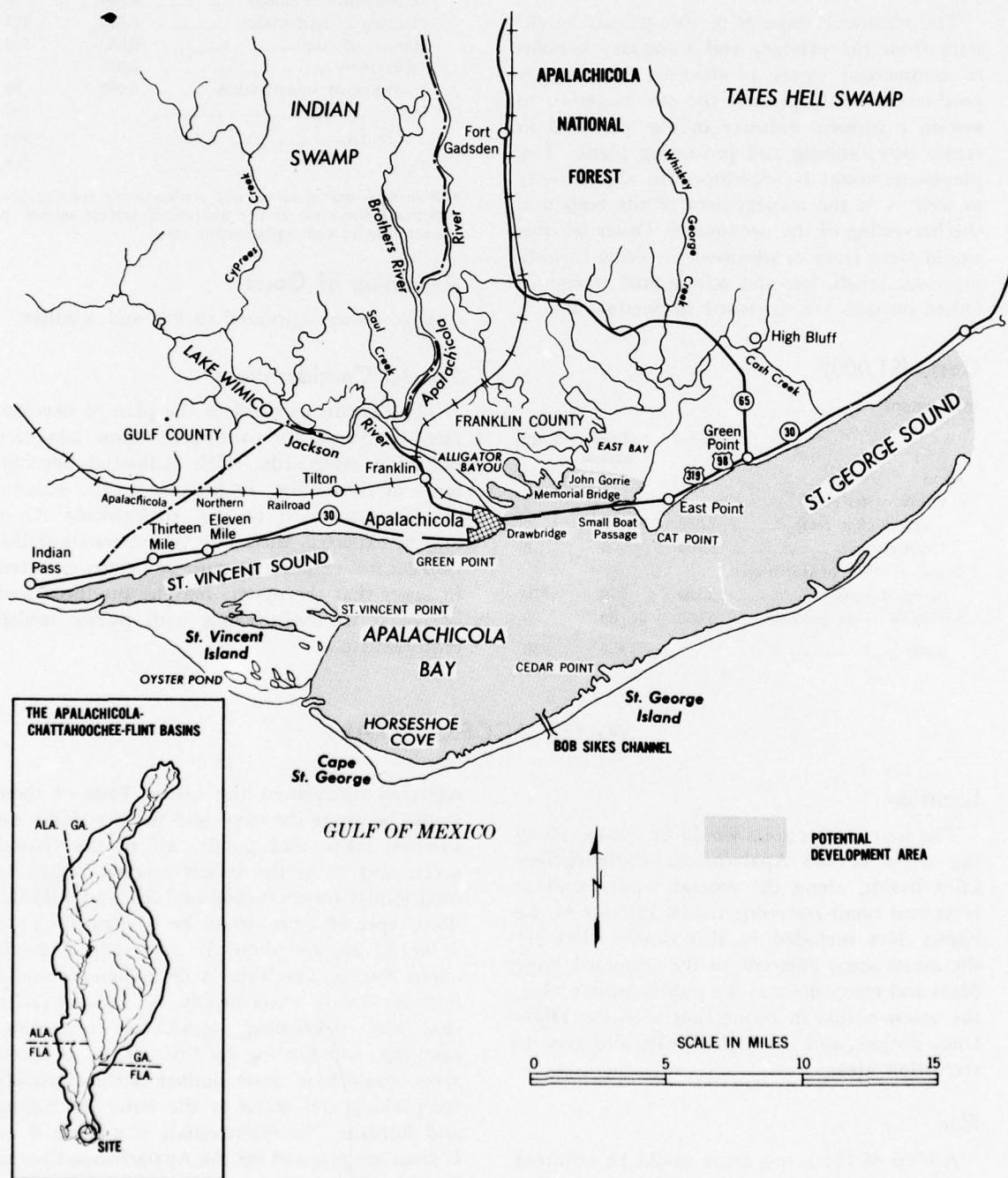


Figure 4.18

Benefits

Annual Equivalent Primary Tangible

Oyster development \$1,307,000

Impacts

The economic impacts of this project would stem from the primary and secondary benefits of commercial oyster production. New oyster production would provide the raw materials to sustain a historic industry in the area and to create new canning and processing plants. Employment would be developed in this activity as well as in the management of the reefs and the harvesting of the production. Other benefits would stem from employment in firms furnishing cans, labels, ice, and refrigerated transport. Other impacts are discussed in Section III.

Costs (\$1,000)

Investment

	Acres	Early action	Total
Land			
Public oyster reefs (producing reef)	2,350	0	0
Depleted reefs	3,700	0	0
Initial planting of cultch on depleted reefs	3,700	370	370
Survey of oyster bottoms	6,050	60	60
Total	430	430	

Annual Equivalent

	Acres	Total
Investment	21	
Operation, maintenance, and replacements		
Annual leases	8,700	2
Maintenance of cultch	6,050	60
Planting of seed oyster	6,050	121
Harvest of crop	6,050	363
Supervision	6,050	60
Management investigation	6,050	60
Other		100
Subtotal		•766
Total		787

* Operation, maintenance, and replacements costs at year 2000 are the same as the annual equivalent operation, maintenance, and replacements costs.

Allocation of Costs

All costs are allocated to fish and wildlife.

Special Considerations

The benefits ascribed to the plan of development outlined are contingent upon adequate pollution safeguards. With industrial development of the basins, an increase in the volume of waste materials in the Apalachicola River may be expected. Intrastate and interstate pollution control regulations must be strictly enforced in order that the oysters may be produced and harvested in conformance with public health requirements.

WATER ACCESS AREAS

Location

The water-access areas would be located along the rivers of the Apalachicola-Chattahoochee-Flint basins, along the coastal waters, and at lakes and small reservoirs in the interior of the basins. Not included in this classification are the access areas adjacent to the proposed large dams and reservoirs and the public fishing lakes, the access points in connection with the Highlands project, and the high density and general recreation areas.

Plan

A total of 154 access areas would be acquired and developed at readily available locations

scattered throughout the basins. Four of these would be along the coast and the remainder on streams, lakes, and ponds. All of the coastal access and 42 of the inland accesses would be used jointly for recreation and fish and wildlife. Two types of areas would be developed: Type A would average about 75 acres and Type D about 2 acres. The Type A developments would include: Roads; water supply and sanitary facilities; and sightseeing, picnicking, swimming, camping, and boating facilities. Type D access areas would have more limited facilities mainly for parking and access to the water for fishing and hunting. No intermediate size Type B or C areas are planned for the Apalachicola-Chattahoochee-Flint basins.

Data

Item	Georgia		Florida		Alabama		Total	
	Type of area A	Type of area D						
Number	25	65	13	21	8	22	46	108
User-days (1,000)								
Recreation	2,500	—	1,300	—	800	—	4,600	—
Fish and wildlife	50	130	26	42	16	44	92	216
Subtotal	2,550	130	1,326	42	816	44	4,692	216
Total	2,680		1,368		860		4,908	

Ninety-four areas would be developed by 1975, including the 4 Type A joint-use sites on the coast, 18 joint-use sites on streams and lakes, and 72 Type D sites on streams for fish and wildlife.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia	Florida	Alabama	Total
Recreation	4,185	2,180	1,340	7,705
Fish and wildlife	90	35	30	155
Total	4,275	2,215	1,370	7,860

Impacts

The access areas would provide a wide distribution of low-cost facilities to make the streams, lakes, and coastal areas available all over the basins. Use of private land along water bodies is becoming more and more restricted. This restriction limits the use of the basins water bodies and makes fishing and other water-based activities more and more difficult for the public. The objective of the access areas is to keep the fishing areas available to the public and, at the same time, protect the rights of private property holders.

The access sites would provide convenient points to reach the streams, lakes, and Gulf coast for fishing, flood forecasting, water sampling, and other purposes outside the recreational field.

Other general impacts are discussed in Section III.

Costs (\$1,000)

	Georgia	Florida	Alabama	Total
Investment				
Early action	5,390	2,670	1,840	9,900
Total (1960-2000)	10,950	5,520	3,530	20,000
Annual Equivalent				
Investment	397	200	127	724
Operation, maintenance, and replace- ments	677	340	218	1,235
Total	1,074	540	345	1,959

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Georgia				
Recreation	9,752	982	629	629
Fish and wildlife	1,203	88	45	45
Total	10,955	1,070	674	674
Florida				
Recreation	5,075	511	327	327
Fish and wildlife	440	34	17	17
Total	5,515	545	344	344
Alabama				
Recreation	3,123	314	202	202
Fish and wildlife	407	30	15	15
Total	3,530	344	217	217
Total				
Recreation	17,950	1,807	1,158	1,158
Fish and wildlife	2,050	152	77	77
Total	20,000	1,959	1,235	1,235

UPSTREAM WATERSHED PROJECTS

Location

While no specific locations are selected for final development, watershed areas in the basins were analyzed as typical projects.

Plan

Multiple-purpose flood prevention and drainage projects are proposed for development between 1960 and 2000 on tributary streams drain-

ing some 1.9 million acres. The structural works of improvement would protect and provide for the improvement of agricultural lands and other areas. In addition, many of the desired land-use changes would be made possible by more effectively utilizing, protecting, and developing the land and water resources of the basins.

Changes in the criteria for project selection, evaluation, installation and cost sharing due to legislative changes which cannot be predicted, or increased local interest, or other factors such as changes in the amount of watershed technical assistance, would substantially change the estimate and result in a different rate of watershed project installations. The possibility of changes in the watershed program is recognized. Appropriate recognition of actual developments and resulting modifications can be accomplished as a part of keeping the plan up to date.

Upstream watershed projects would provide watershed protection, flood prevention, and water resources development for other purposes in the upstream areas. The structural works of improvement would result in reducing the average annual floodwater and sediment damages occurring under existing conditions on a substantial area of flood plains in the small-stream watersheds. Flood protection in these areas would enable landowners to convert some low value production and use areas to highly productive areas because of the existing flood hazards.

Many opportunities exist in the proposed reservoirs in the upstream watersheds for recreation facilities, for fish and wildlife developments, for storing water for other beneficial uses, and for reducing floodwater and sediment damages. To the extent the reservoirs are made available to and managed for public use, they will provide substantial portions of the projected needs for recreation and fish and wildlife as well as other purposes. In developing detailed plans for each of the upstream watersheds, the needs for all

purposes should be considered and facilities included wherever needed and feasible. Adjustments in other proposals in the plan could and should be made for that portion of the projected needs by the upstream reservoirs.

Benefits from reduction of floodwater and sediment damage to agricultural lands and fixed improvements and increases in production would accrue to the affected areas when works of improvement are installed.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Flood prevention	2,500
Drainage	1,700
Total	4,200

Impacts

Corrective measures to prevent soil erosion together with utilization of sediment storage capacities provided in upstream structures will reduce sediment storage requirements in downstream reservoirs.

Costs (\$1,000)

	Early action	Total
Investment		
Flood prevention	22,900	24,800
Drainage	2,100	5,600
Total	25,000	30,400

Annual Equivalent

Investment	1,100
Operation, maintenance, and replacements*	400
Total	1,500

Allocation of Costs (\$1,000)

	Invest- ment	Annual equivalent	
		Total	OM&R*
Flood prevention	24,800	1,242	309
Drainage	5,600	258	91
Total	30,400	1,500	400

* Operation, maintenance, and replacements costs at year 2000 are the same as the annual equivalent operation, maintenance, and replacements costs.

FLOOD CONTROL LEVEES

Location

Levee projects are proposed for areas at Blountstown and River Junction, Florida, along the Apalachicola River; a small area at Mari-

anna, Florida, on the Chipola River; portions of Bainbridge, Newton, and Radium Springs, Georgia, along the Flint River; and portions of Columbus, Georgia, and Phenix City, Alabama, along the Chattahoochee River.

Plan

Apalachicola River

A system of levees is proposed to protect areas subject to overflow at Blountstown and River Junction, Florida.

The levee at Blountstown would protect an area of about 150 acres in the southeast section of the town flooded by backwater from the Apalachicola River. The earth levee would be about 13,260 feet long and average 11 feet in height. In addition, there would have to be a pumping plant and a closure structure at a point where the levee would cross a railroad.

At River Junction the levee would be 1,800 feet long with an average height of 17 feet. There would also be a pumping plant. The levee would protect about 20 acres of urban land in the flood plain.

Chipola River

This levee would protect a small community located about 0.7 miles north of U. S. Highway No. 90 on the right bank of the Chipola River near Marianna, Florida. The levee would average 6 feet in height and be 1,600 feet long.

Flint River

The levee at West Bainbridge, Georgia, would protect about 300 acres of development on the right bank of the Flint River lying north and south of the U. S. Highway No. 27 river crossing. It would be about 11,750 feet long and have an average height of 11 feet. A pumping plant would be needed.

Protection of the 220 acres of business and residential area subject to overflow from the Flint River at Newton, Georgia, would require a pumping plant and a levee about 9,300 feet long and averaging 10 feet in height.

A plan of protection by means of a levee system is proposed for Radium Springs, a resort and residential development about 4 miles south of Albany, Georgia. The resort operates throughout the year and is built around a spring which flows at the rate of about 70,000 gallons per minute. The proposed levee, which would protect the resort area and an exclusive residential area, would be constructed on the left bank of the Flint River between river miles 96 and 99.

It would be about 14,350 feet long and have an average height of 17 feet. Removal of the flow from the spring and interior drainage would necessitate a pumping plant with a capacity of 150,000 gallons per minute.

Chattahoochee River

Along the west or right bank of the Chattahoochee River at West Point, there is a 90-acre area subject to flooding. The area contains 110 retail stores, warehouses, and service establishments and 27 dwellings. The levee system considered for West Point to protect the business district would be located on the right descending bank and would have an average height of 15 feet and a total length of 8,820 feet of which 6,860 feet would be earth dikes and 1,960 feet would be concrete floodwall. The upper end would tie into an existing levee at the Atlanta and West Point Railroad bridge.

A levee would protect a small developed area of the flood plain at Phenix City, Alabama, across the river from Columbus. This area lies along Hollands Creek which empties into the Chattahoochee River near mile 160. A levee crossing near the mouth of the creek would be required. It would be about 1,000 feet long and have an average height of 25 feet. The levee systems for the Phenix City-Columbus industrial areas are treated in a separate portion of this Section.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia	Florida	Alabama	Total
Blountstown, Florida		113		113
River Junction, Florida		18		18
Marianna, Florida		5		5
Bainbridge, Georgia	34			34
Newton, Georgia	19			19
Radium Springs, Georgia	75			75
West Point, Georgia	180			180
Phenix City, Alabama			18	18
Total	308	136	18	462

Impacts

Impacts are discussed in Section III.

Costs (\$1,000)

Early Action — It is expected that about \$1 million of the total investment will be expended during the early action phase.

	Georgia	Florida	Alabama	Total
Total Investment				
Blountstown, Florida	500	500		
River Junction, Florida	130	130		
Marianna, Florida	20	20		
Bainbridge, Georgia	500	500		
Newton, Georgia	350	350		
Radium Springs, Georgia	1,830	1,830		
West Point, Georgia	1,530	1,530		
Phenix City, Alabama		340	340	
Total	4,210	650	340	5,200
Annual Equivalent				
Investment				
Blountstown, Florida	18	18		
River Junction, Florida	2	2		
Marianna, Florida	1	1		
Bainbridge, Georgia	18	18		
Newton, Georgia	13	13		
Radium Springs, Georgia	67	67		

	Georgia	Florida	Alabama	Total
West Point, Georgia	55			55
Phenix City, Alabama			12	12
Total	153	21	12	186
Operation, maintenance and replacements*				
Blountstown, Florida		12		12
River Junction, Florida		4		4
Marianna, Florida				
Bainbridge, Georgia	7			7
Newton, Georgia	5			5
Radium Springs, Georgia	15			15
West Point, Georgia	16			16
Phenix City, Alabama			6	6
Total	43	16	6	65
Total	196	37	18	251

* Operation, maintenance, and replacements costs at year 2000 are the same as the annual equivalent operation, maintenance, and replacements costs.

Allocation of Costs

All costs are allocated to flood control.

WATER SUPPLIES

Location

The water supply programs are basinwide.

Plan

The programs to provide adequate water supplies for domestic, municipal, and industrial uses include the development or improvement of new sources, treatment facilities, elevated storage, distribution systems, and water storage in multiple-purpose reservoirs. Water made available under these programs would service domestic, municipal, and industrial needs for over a billion gallons per day by 2000. The portions of the program associated with multiple-purpose projects are covered in summaries for those projects and are excluded here.

Data

Domestic Supplies

Domestic water systems are expected to de-

cline in number from 63,000 in 1960 to 51,000 by the year 2000. Water use for the same years is expected to increase from 14.2 to 23.0 million gallons per day. This reduction in the numbers of systems is expected because of the expansion of municipal water systems. The increased use is expected to result from greater per capita demand.

The plan would satisfy the following needs:

New drilled wells	22,000
Wells to be covered and sealed	15,000
Pressure systems	1,000
New pumps and motors	51,000

Municipal Supplies

Municipal water systems of 151 communities served an estimated 1,646,000 persons living in 184 communities and institutions in 1960. More than 300,000 of these people lived in the Altamaha basin. By 2000, it is estimated these systems will have to be expanded to serve an estimated 4,653,000 persons, including about 1

million persons living outside the Apalachicola-Chattahoochee-Flint basins. Municipal water demands by 2000 are estimated at 945 million gallons per day, including about 169 million gallons per day to be furnished to industries. Requirements include:

	Number of municipalities
Surface sources	26
Wells	45
Disinfection equipment	55
Treatment plants (new or additions)	44
Elevated storage	85
Expansion of distribution systems	218

Industrial Supplies

Increased industrial growth is expected to require about 225 million gallons of water per day by the year 2000. About 169 million gallons per day would be supplied by expanded municipal water supply systems. About 56 million gallons per day would be supplied by industrial supply systems of one type or another. Requirements include:

	Number
Wells	25
Intakes	3
Chlorinators	12
Storage facilities	5

Benefits

Benefits are assumed to be equal to or exceed the costs of the cheapest alternatives and are not expressed in monetary terms except for multiple-purpose projects where allocations are required. The alternatives in most cases are other wells which are identical or similar to the recommended facilities.

Costs (\$1,000)

	Georgia	Florida	Alabama	Total
Investment				
Early action				
Domestic	31,900	2,300	4,600	38,800
Municipal	76,740	1,570	9,050	87,360
Industrial*	670	70	—	740
Total	109,310	3,940	13,650	126,900

RECLAMATION, IRRIGATION, AND DRAINAGE

Location

The reclamation, irrigation, and drainage pro-

	Georgia	Florida	Alabama	Total
Total (1960-2000)				
Domestic	31,900	2,300	4,600	38,800
Municipal	303,300	3,620	15,880	322,800
Industrial*	900	100	—	1,000
Total	336,100	6,020	20,480	362,600
Annual Equivalent				
Domestic				
Investment	955	70	148	1,173
Operation, maintenance, and replacements	197	13	25	235
Subtotal	1,152	83	173	1,408
Municipal				
Investment	6,380	84	386	6,850
Operation, maintenance, and replacements	15,650	203	1,037	16,890
Subtotal	22,030	287	1,423	23,740
Industrial*				
Investment	25	2	—	27
Operation, maintenance, and replacements	303	22	—	325
Subtotal	328	24	—	352
All water supplies				
Investment	7,360	156	534	8,050
Operation, maintenance, and replacements	16,150	238	1,062	17,450
Total	23,510	394	1,596	25,500
Operation, Maintenance, and Replacements at Year 2000				
Domestic	500	30	70	600
Municipal	30,300	390	1,760	32,450
Industrial*	440	40	—	480
Total	31,240	460	1,830	33,530

* Does not include industrial water supplies furnished by municipal systems.

Allocation of Costs

All costs are allocated to water supplies.

grams would be carried out on irrigable areas of the basins used for cropland and on wetland areas of the basins used for cropland and pas-

tureland. Drainage of woodland is discussed under Forest Conservation and Utilization.

Plan

The reclamation, irrigation, and drainage programs summarized in this Section are exclusive of those associated with multiple-purpose projects and discussed elsewhere in this Appendix. Drainage in upstream areas is included in the upstream watershed projects.

The irrigation program includes sprinkler systems on individual farms to irrigate an estimated 17,800 additional acres of cropland. Irrigation of home gardens, nurseries, lawns, and nonagricultural areas would be in addition to the cropland acres. It is estimated that in the Piedmont 73 percent of the irrigation water will be from ponds and 27 percent from streams, and in the Coastal Plain 45 percent of the water will be from ponds and 55 percent from wells and streams. Crops to be irrigated include tobacco, orchards, cotton, truck crops, corn, and speciality crops. The irrigated acres would require a high level of conservation treatment for protection and efficient use.

The features of the drainage program include onfarm open ditch drainage systems on an estimated 39,000 additional acres of cropland and pastureland. Crops to be grown on drained land include tobacco, corn, cotton, peanuts, truck and other speciality crops, and pasture.

Individual farmers are expected to install the irrigation and drainage systems with technical and financial assistance provided by private concerns and State and Federal programs.

Benefits

Annual Returns to Farmers (\$1,000)

	Georgia	Florida	Alabama	Total
Irrigation	634	74	139	847
Drainage	405	47	92	544
Total	1,039	121	231	1,391

Impacts

Irrigation would provide insurance against drought conditions and assist in prompt germination and continuous plant growth of new

seedings. The survival of transplanted material, and the maturing of crops, would help in establishing vegetative cover on eroded areas and would provide for better use of land in accordance with its capability. Drainage also would provide for improved land preparation, seeding, cultivation, management, and harvesting. Other impacts are discussed in Section III.

Costs (exclusive of technical assistance) (\$1,000)

	Georgia	Florida	Alabama	Total
Investment				
Early action				
Irrigation	1,106	134	260	1,500
Drainage	162	17	40	219
Total	1,268	151	300	1,719
Total				
Irrigation	1,760	205	385	2,350
Drainage	442	50	108	600
Total	2,202	255	493	2,950
Annual Equivalent				
Irrigation				
Investment	64	7	14	85
Operation, maintenance, and replace- ments*	378	44	83	505
Total	442	51	97	590
Drainage				
Investment	16	2	4	22
Operation, maintenance, and replace- ments*	30	4	7	41
Total	46	6	11	63
Total				
Irrigation and drainage				
Investment	80	9	18	107
Operation, main- te- nance, and replace- ments*	408	48	90	546
Total	488	57	108	653

* Operation, maintenance, and replacements costs for the year 2000 are assumed to be equal to the annual equivalent operation, maintenance, and replacements.

Allocation of Costs

All costs are allocated to irrigation and drainage as shown.

HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

Location

The plan of development proposes construction of an additional 600,000 kilowatts of hydroelectric capacity which would add about 1.2 billion kilowatt-hours to the area power supply. All of the proposed power installations are a part of multiple-purpose projects and are described individually in the project summaries in this Section.

Plan

The added power capacity and energy could be used in the basins for peaking purposes if constructed on an orderly schedule. Additional steam-electric generation would be required, above that under construction and planned, to meet the projected electric power loads. This additional steam-electric capacity would be constructed near sources of cooling water. High-voltage transmission lines will need to be constructed from the sources of energy proposed in the plan to load centers for distribution to ultimate customers. New and expanded substations and distribution lines are expected to be constructed as the need arises. The steam-electric generation plants and the transmission facilities will be constructed as a part of the going power programs.

The industrial expansion required to support the projected increases in the total economic level is directly related to the projected electric load growth, as well as to projections of food and fiber production requirements, basins employment, personal income, and population. The food processing industries are expected to expand in all areas of the basins. Although fewer employees would be needed, textile production is expected to increase through increased efficiency and new technical improvements. Apparel; printing and publishing; stone, clay, and glass; and metal industries are expected to increase from three to five times their present employment. The number of employees in metals is expected to increase from about 26,600 to more than 130,100. Employment in other industries is expected to increase by about four times the present employment. All of these ex-

pansions are expected to be dispersed throughout the basins area. The large metropolitan area of Atlanta will be the center for many of the industries in heavy machinery, electrical machinery, and metal fabrication. Apparel, lumber, stone, and clay products plants would locate more in the rural areas and near sources of raw material. Outdoor recreation in the basins area is expected to increase in importance, thus furnishing markets for all types of recreation associated equipment in all sections of the basins. Industrial expansion in the manufacturing segment would furnish opportunities for employment in trades, services, and construction. As communities and suburban areas increase in size and population, the demand for governmental services increases and new job opportunities are created.

The attainment of the desired development to accomplish the projected economic goals depends, to a great extent, on the initiative and resourcefulness of the people. City, city-county, or cooperative county planning and development commissions or committees can determine the potentials of their area and devise plans and programs to utilize the resources to advantage. The systematic development of land and water resources can be an important factor in attracting new manufacturing establishments. The implementation of the plan presented herein in broad terms by detailed local plans and programs would be an inducement to many industries to locate in the basins. The proposals herein presented should stimulate economic growth and be an aid to local groups and agencies in their planning activities.

Data

Data for power features of the plan are included under the related multiple-purpose projects.

Benefits and Costs

Benefits and costs of power features are tabulated under the multiple-purpose developments that include power as a purpose.

SOIL CONSERVATION AND UTILIZATION

Location

The soil conservation and utilization program would be carried out on cropland, pastureland, and rangeland throughout the basins.

Plan

Features of the soil conservation and utilization plan for the Apalachicola-Chattahoochee-Flint basins include:

(1) The treatment of about 1,690,000 acres of cropland, pastureland, and rangeland by the installation of annual and enduring soil conservation measures and practices which would consist of establishment or reestablishment of vegetative cover, the improvement of vegetative cover, erosion control practices, management of grazing, and protection from fire.

(2) The installation of about 15,000 farm ponds from 1960 to the year 2000 for livestock and irrigation water, and which could also provide for fishing and some unclassified recreation use.

(3) The conversion of about 284,000 acres of woodland, pastureland, and other lands to cropland, and 386,000 acres of cropland, woodland, and other lands to pastureland.

Land owners and operators will install the above measures on an individual farm basis and in upstream watershed projects with technical and financial assistance from State and Federal programs.

Pressure is being applied to competitive land uses in the basins by expanding nonagricultural uses such as urban and industrial areas and highways. It is estimated that about a half million acres now used for agricultural production will be diverted to such nonagricultural uses by the year 2000. The erosion control and water management problems on these lands will require similar treatment measures as for cropland and pasture and will be applied by private individuals, industries, and local and State entities. At the time these areas are changed into nonagricultural use, the specific problems and solutions will need to be determined and means established to carry out the control measures.

Data

Land Use - 2000

	Acres (1,000)
Cropland and pastureland	4,350
Woodland	6,152
Other	1,857
Total	<u>12,359</u>

Benefits

Annual Returns to Farmers (\$1,000)

	Georgia	Florida	Alabama	Total
Total	5,414	533	1,083	7,030

Impacts

Installation of soil conservation measures and practices on the areas of cropland, pastureland, and rangeland needing conservation treatment is a basic principle in protecting the soil resources and in providing sustained agricultural production in the basins and Nation. The application of these practices and measures would contribute to extending the life of floodwater retarding structures, major reservoirs, and drainage ditches by reducing sediment. By improving water quality, they would reduce the cost of treatment for municipal and industrial use and enhance the value of the reservoirs for fish and wildlife. Other impacts are discussed in Section III.

Costs (exclusive of technical assistance) (\$1,000)

	Georgia	Florida	Alabama	Total
Investment				
Early action	23,850	1,090	3,110	28,050
Total	50,500	2,500	6,900	59,900
Annual Equivalent				
Investment	1,825	91	251	2,167
Operation, maintenance, and replacements	2,435	314	574	•3,323
Total	4,260	405	825	5,490

* Operation, maintenance, and replacements costs at year 2000 are the same as the annual equivalent operation, maintenance, and replacements costs.

Allocation of Costs

All costs are allocated to soil conservation and utilization.

FOREST CONSERVATION AND UTILIZATION

Location

The forest conservation and utilization program would be carried out on the woodland areas throughout the basins.

Plan

The forestry program would include items such as: (1) Technical assistance for managing and harvesting timber and for applying other recommended measures; (2) commercial and noncommercial thinnings to help bring stands to more operable conditions; (3) tree planting

and site preparation for natural regeneration and seeding; (4) detecting and controlling insect and disease infestations; (5) water management by drainage and flood control; (6) forest fire protection by providing needed additional facilities such as towers and tractors, and by increasing air observation and the number of personnel assigned to detection and suppression activities; (7) fencing overgrazed woodland areas to control grazing and prevent damage to tree seedlings by livestock; (8) road building for management and protection activities; (9) additional education and information; and (10) intensified forest research.

Data

Item	Unit	Georgia	Florida	Alabama	Total
Fire protection (new)	acre	195,000	—	—	195,000
Fencing for woodland grazing control	—	1,500	800	200	2,500
Erosion control tree planting	—	144,000	6,000	39,000	189,000
Woodland drainage and water control	—	179,000	25,000	21,000	225,000
Shelterbelts	—	13,300	900	100	14,300
Timber-stand improvement (commercial and noncommercial)	acre	5,125,000	1,068,000	926,000	7,120,000
Other tree planting and site preparation for natural regeneration	acre	3,434,000	716,000	620,000	4,770,000
Annual production — 2000					
Timber cut (million)	cu. ft.	283	65	46	394
Gum-naval stores (thousand)	bbl.	29	4	1	34

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Georgia	4,000
Alabama	800
Florida	915
Total	5,715

Impacts

The increased timber and naval-stores production would have a stabilizing effect on the local economy. The local citizens can gain additional income, if they harvest the timber and gum crops and haul them to local distribution points. Further processing of the material locally would mean increased manufacturing employment and additional services and would create a need for satellite industries. The multiplier effect of production on the local economy would include increased tax returns, town development, and social improvements.



Figure 4.19 Log and Lumber Storage at Sawmill near Camilla, Georgia. Forestry Provides Opportunity for Local Industry.

Costs (\$1,000)

	Georgia	Florida	Alabama	Total
Investment				
Early action				
Forest fire protection	60			60
Fencing for woodland grazing control	450	250	60	760
Erosion control tree planting	3,600	150	980	4,730
Water control and forest roads	9,220	4,440	1,200	14,860
Shelterbelts	200	20	•	220
Timber-stand improvement (commercial and noncommercial)	3,860	800	700	5,360
Other tree planting and site preparation for natural regeneration	21,980	4,580	3,970	30,530
Total	39,870	10,240	6,910	56,520
Total (1960-2000)				
Forest fire protection	60			60
Fencing for woodland grazing control	450	250	60	760
Erosion control tree planting	3,600	150	980	4,730
Water control and forest roads	10,700	4,640	1,370	16,710
Shelterbelts	200	20	•	220
Timber-stand improvement (commercial and noncommercial)	17,920	3,730	3,230	24,880
Other tree planting and site preparation for natural regeneration	57,910	12,070	10,460	80,440
Total	90,840	20,860	16,100	127,800

•Costs negligible.

Annual Equivalent

Investment	2,105	482	373	2,960
Operation, maintenance, and replacements	987	206	178	1,371
Total	3,092	688	551	4,331

Operation, Maintenance, and Replacements at Year 2000	1,812
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Allocation of Costs

All costs are allocated to forest conservation and utilization.

FISH AND WILDLIFE

Location

The single-purpose wildlife and sport fisheries programs would be basinwide. The commercial fisheries program is located in the Gulf coastal areas. Fish and wildlife facilities included in multiple-purpose projects are described as part of specific projects.

Plan

Sport fisheries programs and projects, as proposed, are designed to meet the need for 5.9 million user-days of sport fishing by 2000. Selection of developments to meet these needs have been guided by recognition of the desirability of a balanced distribution of fishing pressure by

types of fishing water, streams, large impoundments, small impoundments, salt waters, by geographical location, resource potentials, and costs of developments.

Wildlife programs and projects are designed to meet a total demand of 1.2 million user-days of hunting by 2000. Selection of developments to meet these needs have been guided by trends in hunting by type, resource potentials, and feasibility of developments.

The features of the wildlife program are: (1) Further improvement of wildlife habitat on national forest lands, military areas, and federally administered reservoir properties, with provision for public use; (2) further improvement of wildlife habitat on public and private lands now

being managed by the State Game and Fish Departments of Georgia, Florida, and Alabama; (3) establishment and development of 10 new wildlife management areas in Alabama and 12 new wildlife management areas in Georgia, totaling about 621,000 acres, exclusive of that included in the Chipola, Cedar Creek, and Highlands projects; (4) establishment and development of the Eufaula National Wildlife Refuge on lands within and near the Walter F. George Dam and Reservoir projects; (5) development of about 8,000 acres of dove fields for public hunting purposes in accordance with practices approved by the conservation agencies; (6) acquisition and development of certain wildlife lands along the Chipola River, Florida, as an integral part of the proposed Chipola River project; (7) acquisition and development of certain wildlife lands in the vicinity of Dog River as an integral part of the Cedar Creek dam and reservoir project on the Chattahoochee River near Atlanta, Georgia; (8) extensive management of wildlife habitats throughout the basins by interested land-owners in cooperation with State and Federal agencies; and (9) the expansion and acceleration of current activities in research, planning, education and information, and management and enforcement.

The features of the sport fisheries program are: (1) Improvement of the Chattahoochee River for sport fishing by further abatement of pollution in the vicinity of Atlanta and Columbus and intensive management of the trout waters below Buford Dam and Reservoir project; (2) renovation and more intensive management of existing and prospective large and small impoundments; (3) development of at least 6 large impoundments in Alabama and about 23 in Georgia totaling 24,000 surface acres to be intensively managed privately for public fishing; (4) development of about 100,000 acres of other large impoundments in conjunction with other functions; (5) preservation and development of the Chipola River, Florida, as a free-flowing stream with provision for improved access, zoning of the streambanks as to type of development, control of timber harvest, and other measures as described in the multiple-function analysis of this project; (6) full development of the sport fishing potentials of the

mountain streams of the Chattahoochee basin as an integral part of the proposed Highlands project; (7) development of public access areas to streams and public lakes; (8) expansion of existing hatcheries and construction of new facilities as will be required to meet the needs for stocking of new lakes and renovation of existing ones, including stocking of cold water streams with trout or other suitable species; and (9) expansion and acceleration of current activities in research, planning, education, protection, and management.

The salt-water sport fisheries program would emphasize those measures which would bring fish and fishermen together. The marine waters of the basins are capable of producing several times the amount of game fish which would be needed to meet the projected requirements, provided the inshore waters are protected against pollution, landfills, dredging, and other activities which are detrimental to fish production and utilization. Five fishing reefs 3 to 4 feet high would be developed offshore, submerged in from 20 to 60 feet of water; one fishing pier to accommodate at least 50,000 anglers annually would be constructed; a party boat would be equipped to operate out of Apalachicola or nearby port; access to salt water would be provided complete with landing ramps and picnic areas; bridges which cross the bays and inlets would be equipped with catwalks to provide convenient and readily available fishing opportunities to the public; jetties and breakwater structures would be improved with walkways and handrails to promote safe use of these popular facilities; navigational aids would be erected to guide the sport fishermen to the most productive crops; maps and information concerning available facilities and fishing opportunity would be prepared and disseminated; current activities concerning research, planning, education, protection, and management would be expanded; and new activities initiated with a view toward attracting a larger proportion of the rapidly increasing number of salt-water anglers.

The commercial fisheries program would consist of: (1) Expansion of existing operations; (2) rehabilitation of oyster-producing reefs; (3) cultivation of shrimp, pompano, and other high quality food fish under controlled conditions; (4) acceleration and expansion of existing facil-

ties and going programs with a view toward more efficient harvest, better methods of handling and processing the catch, new sources of supply, sound regulations, and enforcement; (5) increasing the demand for domestic products; and (6) abatement of pollution. With these programs in effect, and considering the advantages of improved technology, it is expected that the total production of fish will be increased to about 18.3 million pounds annually by 1975 and to 29.7 million pounds by 2000.

The existing fishing fleet is large enough to harvest many more pounds of fish from the sea as new sources of the more heavily utilized fishes are found and the market increased for other fishes which are locally abundant. Fishing gear would be improved by experiment and demonstration, and the operations would be expanded to achieve a greater harvest of known and prospective supplies of commercial fish.

Known shrimp resources are fully utilized at present. The catch along the Gulf coast has not increased in recent years, despite a marked increase in fishing pressure. The saline marshes

and shallow inshore waters of the basins, however, afford great potentials for seafood culture, and results thus far achieved through experimental pond culture of shrimp and pompano provide sufficient basis for the initiation of experimental management programs. Extensive application of proven practices may be anticipated with practical demonstrations of this technology.

The crab fishery affords one of the most favorable opportunities to help meet the requirements for shellfishes. There is an abundance of this type of fishery in the coastal waters of the basins for which there has been a steadily growing market.

The catch of finfish could be expanded to meet established goals. Methods of handling and processing of such species as mullet and speckled trout must first be improved to create quality products that will compete with seafoods from other areas. With improved gear and methods of fishing, the yield per unit of effort can be increased and operations expanded at reasonable cost.

Data

	Unit	Georgia	Florida	Alabama	Total
Wildlife					
Improvement of existing facilities					
National forests	acre	1	113,000	---	113,000
Military areas	acre	170,000	---	12,000	182,000
Reservoir lands	acre	34,000	8,000	3,000	45,000
State wildlife areas	acre	1	103,000	14,000	117,000
Development of new facilities					
Highlands Wildlife Management Area ¹					
Dog River ³					
Harris County	acre	30,000	---	---	30,000
Stewart County	acre	35,000	---	---	35,000
Talbot County	acre	35,000	---	---	35,000
Heard County	acre	40,000	---	---	40,000
Lake Seminole	acre	20,000	20,000	20,000	20,000
Eufaula National Wildlife Refuge	acre	---	---	11,000	11,000
Chipola River Wildlife Management Area ⁴					
Other wildlife management areas	acre	100,000	---	350,000	450,000
Dove fields	acre	4,000	2,000	2,000	8,000
Extensive habitat improvements					
Supporting programs					
Basinwide					
Basinwide					
Fresh-Water Sport Fisheries					
Improvement of existing waters					
Cold water streams	mile	530	---	---	530
Warm water streams ⁶	mile	575	170	515	1,260
Large impoundments	acre	105,000	29,000	25,000	159,000
Small impoundments	acre	26,000	4,000	4,000	34,000

	Unit	Georgia	Florida	Alabama	Total
Development of new waters					
Large multiple-purpose impoundments ⁷	acre	23,000	...	1,000	24,000
Large fishing impoundments	acre				
Separate facilities					
Fish cultural stations (trout) ¹	site	90	30	30	150
Fish cultural stations (warm water) ¹	site				
Water access	site				
Supporting programs					
Salt-Water Sport Fisheries					
Facilities					
Fishing reefs	reef	...	10	...	10
Fishing piers	pier	...	1	...	1
Water access	site	...	4	...	4
Supporting programs					
Commercial Fisheries					
Expansion of operation					
Seafood culture					
Oysters	acre	...	6,000	...	6,000
Shrimp	acre	...	200	...	200
Supporting programs					

NOTES: ¹ See Highlands project.

² Land above level of power pool.

³ See Anneewakee and Dog River multiple-purpose projects.

⁴ See Chipola River project.

⁵ From Buford Dam to Morgan Falls Dam near Atlanta, Georgia. Development of mountain streams included in Highlands project.

⁶ See Pollution Abatement.

⁷ See multiple-purpose reservoir projects.

For the year 2000, estimated increases over 1960 in user-days of hunting and sport fishing, and in pounds of commercial fish, associated with the above program features are as follows:

	User-days annually (1,000)			
	Georgia	Florida	Alabama	Total
Hunting and sport fisheries (thousands of user-days)				
Hunting				
Hunting	663	305	241	1,209
Fresh-water sport fishing				
Fresh-water sport fishing	3,909	1,066	705	5,680
Salt-water sport fishing				
Salt-water sport fishing	...	232	...	232
Total	4,572	1,603	946	7,121
Commercial fisheries (thousands of pounds)				
Expansion of operations				
Expansion of operations	11,167	...	11,167	
Seafood culture				
Oysters	4,313	...	4,313	
Shrimp	160	...	160	
Total	15,640	...	15,640	

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia	Florida	Alabama	Total
Increased value				
Hunting	1,645	675	590	2,910
Fresh-water sport fishing	5,005	1,150	855	7,010
Salt-water sport fishing	...	630	...	630
Commercial fishing				
Expansion of operations	...	855	...	855
Seafood culture				
Oysters	...	*	...	*
Shrimp	...	35	...	35
Total	6,650	3,345	1,445	11,440

* See Apalachicola Bay Development project.

Impacts

Appreciable benefits would be derived from general enhancement of the recreational opportunities in a given locality. The growth of many towns and cities in this portion of the Southeast will depend to a great extent on their attractive-

ness and proximity to land and water affording good hunting and fishing.

The commercial fisheries industry, although one of the oldest enterprises in the basins, has not kept pace with the economic growth of the region. It is plagued by the vagaries of weather, seasonal fluctuation of supply, pollution, precarious market conditions, lack of good conservation practices, and competitive products. Without the implementation of programs described, it is doubtful that many able and energetic young men will be attracted to the industry. In such event, further decline in the vigor of the economy based on this resource may be anticipated. With implementation of programs described, the industry would be stimulated and the local economy strengthened by affording additional employment in harvesting the fish crop, processing and handling of the catch, construction of boats and buildings, and the sale of fishing supplies.

Fish and wildlife impacts are discussed in more detail in Section III, Impacts of the Plan, of this Part.

Costs (\$1,000)

	Georgia	Florida	Alabama	Total
Investment				
Early action				
Wildlife	320	...	900	1,220
Fresh-water sport fisheries	1,911	43	462	2,416
Salt-water sport fisheries	...	155	...	155
Commercial fisheries				
Expansion of operations	...	...	...	...
Seafood culture				
Oysters	...	•	...	•
Shrimp	52	...	52	52
Total	2,231	250	1,362	3,843
Total program				
Wildlife	920	...	700	1,620
Fresh-water sport fisheries	32,722	111	902	33,735
Salt-water sport fisheries	...	205	...	205
Commercial fisheries				
Expansion of operations	...	...	...	...

	Georgia	Florida	Alabama	Total
Seafood culture				
Oysters	...	•	...	•
Shrimp	...	240	...	240
Supporting programs	...	...	...	...
Total	33,642	556	1,602	35,800

Annual Equivalent

Investment				
Wildlife	33	...	25	58
Fresh-water sport fisheries	1,180	4	33	1,217
Salt-water sport fisheries	...	7	—	7
Commercial fisheries				
Expansion of operations	...	...	...	...
Seafood culture				
Oysters	...	•	...	•
Shrimp	...	9	...	9
Supporting programs	...	...	...	...
Subtotal	1,213	20	58	1,291
Operation, maintenance, and replacements				
Wildlife	704	300	331	1,335
Fresh-water sport fisheries	2,470	335	330	3,135
Salt-water sport fisheries	...	96	...	96
Commercial fisheries				
Expansion operations	...	63 ^e	...	635
Seafood culture				
Oysters	...	•	...	•
Shrimp	...	34	...	34
Supporting programs	...	94	...	94
Subtotal	3,174	1,494	661	5,329
Total	4,387	1,514	719	6,620

Operation, Maintenance, and Replacements at Year 2000

4,244 1,906 734 6,884

^e See Apalachicola Bay Oyster Development project.

Allocation of Costs

All costs are allocated to fish and wildlife.

RECREATION

Location

The recreation developments would be distributed throughout the basins.

Plan

The recreation developments in specific multiple-purpose projects have already been described and summarized. Single purpose developments included in the recreation program and their related costs and benefits are in this Section of the Report.

Five areas in the basins have been developed for intensive use. Another area along the Gulf of Mexico, although little used at present, could, with development, meet the needs of the projected population increases and the resulting demand for such areas.

Three areas along the Gulf of Mexico are partly developed for salt-water bathing and associated activities. These include Highlands north of Port St. Joe, Florida; Money Bayou on the Gulf west of Indian Pass; and an area near Apalachicola, Florida. Facilities at these Florida beaches would be expanded to accommodate 1.5 million user-days by the year 2000 and include improved access roads, parking areas, water supplies, sanitary facilities, and facilities for picnicking and swimming. Additional land would be required.

New beaches along the Gulf of Mexico that are either inaccessible or undeveloped include St. Joseph Spit, areas on St. Vincent and St. George Islands, and mainland areas along Apalachicola Bay. Facilities would be provided for 10 million user-days by the year 2000.

Facilities would be expanded at Chehaw State Park and Radium Springs near Albany, Georgia, to accommodate 400,000 user-days in 2000.

Senoia State Park and Callaway Gardens south of Atlanta provide opportunities for swimming and related activities. Facilities would be expanded to accommodate 1,050,000 user-days annually by the year 2000.

Chattahoochee State Park in Houston County, Alabama; Florida Caverns State Park near Marianna, Florida; Franklin D. Roosevelt State Park at Pine Mountain, Georgia; Georgia Veterans

Memorial State Park, on Lake Blackshear near Cordele, Georgia; Kolomoki Mounds State Park, near Blakely, Georgia; Torreya State Park, south of Chattahoochee, Florida; and Unicoi State Park in White County, Georgia, all have facilities for many types of outdoor recreation activities. Facilities would be expanded at these seven parks to accommodate 3,425,000 user-days annually by 2000.

Apalachicola National Forest in Florida; Lake Sidney Lanier, 40 miles northeast of Atlanta; Lake Seminole at the junction of Chattahoochee and Flint Rivers; and Walter F. George Reservoir, a major impoundment on the Chattahoochee River near Eufaula, Alabama, lend themselves to further development as natural environment recreation areas because of the large acreages involved and because these areas are used principally to satisfy other resource needs. These areas, for which further development appears warranted, are discussed below. Costs and benefits are illustrative of what is considered reasonable for development of public outdoor recreation facilities.

Apalachicola National Forest includes some 112,600 acres in Apalachicola-Chattahoochee-Flint basins. This area accommodated about 7,500 user-days in 1959. Additional facilities are needed for camping, hiking, picnicking, swimming, and related activities to accommodate 100,000 user-days by 2000.

Lake Sidney Lanier sustained over 5 million user-days in 1960 and is the most popular single recreation area in the Southeast River Basins. This multiple-purpose reservoir is administered by the Corps of Engineers. Additional facilities would be provided to accommodate 10 million user-days by the year 2000. Facilities would be enlarged and developed at selected locations for high-density use, and other areas would be developed for dispersed activities, such as boating.

Lake Seminole, administered by the Corps of Engineers primarily for navigation and hydroelectric power, had over 1 million visitors in 1959. Additional facilities would be developed to provide for 7 million user-days by 2000. Many areas would be developed for high-density use as well as for general outdoor recreation activities. Extension of the recreation season in the

future would play a significant part in the development and use of facilities.

Walter F. George Reservoir, under construction, will be a major fresh-water area on the lower Chattahoochee River. Facilities would be developed to provide for 5 million user-days by 2000.

Providence Canyon in Stewart County, Georgia, is a unique area around which recreation opportunities could be based. These colorful canyons could be set aside as a park which, while retaining its unique character, would also have facilities for many types of recreation. About 3,500 acres would be needed. Interpretive services could be provided and the easily eroded features could be protected. An estimated 1 million user-days could be accommodated annually by the year 2000.

There are many developed historic and cultural areas in the basins and numerous other undeveloped historical, archeological, and cultural sites. Additional facilities are proposed for 6 of the major existing areas, and for 10 undeveloped historical and archeological sites. Costs and benefits are given to show the magnitudes involved. Subsequent studies may identify other areas which could be similarly developed.

Constitution Convention Historic Memorial is located at Port St. Joe, Florida. Expansion of existing facilities would provide for 25,000 user-days in the year 2000.

Dr. John Gorrie Historic Memorial at Apalachicola, Florida, would be developed to provide for 20,000 user-days by 2000. Some additional land acquisition would be desirable.

The Gold Museum at Dahlonega, Georgia, is an important attraction and serves as a nucleus

around which further development can be centered. Acquisition of a small amount of land would be desirable. The Confederate Naval Museum at Columbus, Georgia, is the only one of its kind and greater visitation is expected. The Warm Springs National Fish Hatchery outside Warm Springs, Georgia, is an added attraction to an area already rich in interesting recreation opportunities. Expansion of existing facilities would accommodate 100,000 user-days by the year 2000 at these three areas.

Kennesaw Mountain Battlefield National Monument in Marietta, Georgia, would have facilities in keeping with its primary objective to depict a Civil War battle. Facilities would be expanded to accommodate 500,000 user-days by 2000.

The Little White House at Warm Springs, Georgia, would be expanded with the development of facilities to accommodate 600,000 user-days by the year 2000.

Ten historic and cultural sites would be developed to accommodate 500,000 user-days by the year 2000. These sites are as follows: (1) Fort Apalachicola in Russell County, Alabama; (2) Fort Gadsden in Liberty County, Florida; (3) Ruff Creek Mill near Smyrna, Georgia; (4) Soap Creek Mill northwest of Atlanta, Georgia; (5) Roswell Mill and town at Roswell, Georgia; (6) Aspalga in Gadsden County, Florida; (7) Canyons in Calhoun and Liberty Counties, Florida; (8) Pierce in Franklin County, Florida; (9) Nacoochee in White County, Georgia; and (10) Neisler near Reynolds, Georgia. Land acquisition would be required but detailed design planning would be worked out as the need for development of such areas occurs.

Data

Existing Developments

High density

	User-days annually (thousands)		
	1960 Base	By 1975	By 2000
Beaches	300	600	1,500
Chehaw State Park	100	150	300
Callaway Gardens	500	700	1,000
Radium Springs	75	75	100
Senoia State Park	20	25	50
General outdoor ¹			
Chattahoochee State Park	10	15	25
Florida Caverns State Park	100	100	200
Franklin D. Roosevelt State Park	500	500	1,000

	1960 Base	By 1975	By 2000
Georgia Veterans Memorial State Park	400	500	1,000
Kolomoki Mounds State Park	200	200	500
Unicoi State Park	300	350	600
Torreya State Park	25	50	100
Natural environment ²			
Apalachicola National Forest	15	25	100
Lake Sidney Lanier ³	6,000	6,000	10,000
Lake Seminole	3,770	4,000	7,000
Historical and cultural			
Constitution Convention Historic Memorial	10	15	25
Dr. John Gorrie Historic Memorial	5	10	20
Gold Museum and Confederate Naval Museum	15	25	50
Warm Springs National Fish Hatchery	10	20	50
Little White House	280	290	580
Kennesaw National Battlefield Park	200	250	500
Subtotal, existing	12,835	13,900	24,700
New Developments			
High density beaches	---	3,000	10,000
Natural environment			
Walter F. George Reservoir	---	1,500	5,000
Unique			
Providence Canyon	---	500	1,000
Historical and cultural			
Ten sites	---	250	500
Subtotal	---	5,250	16,500
Total	12,835	19,150	41,200

NOTES: ¹ Does not include State parks and other recreation areas included in natural environment areas.

² Does not include Highlands project, involving 300,000 user-days in the Apalachicola-Chattahoochee-Flint basins in 1960 and 1,220,000 user-days by the year 2000. This project is analyzed in Appendix 1, Savannah Basin.

³ Includes those high density and general recreation areas located within the larger entity.

Benefits	Costs (\$1,000)	Georgia Florida Alabama Total*				
		Investment	Georgia	Florida	Alabama	
Annual Equivalent Primary Tangible (\$1,000)						
Georgia	16,200	Early action				
Florida	9,980	Existing areas	3,620	5,850	33	8,300
Alabama	4,706	New areas	9,980	8,810	6,293	18,900
Total	*23,440	Total	13,600	14,660	6,326	27,200
		Total (1960-2000)				
		Existing areas	35,420	24,620	100	48,100
		New areas	23,050	28,700	15,670	52,000
		Total	58,470	53,320	15,770	100,100

Impacts

The value added to the economy by expenditures made by recreationists is generally recognized. Less tangible are the benefits derived from general enhancement of the recreational opportunities in a given locality. The growth of many cities and towns in the basins will depend to a great extent on their attractiveness and proximity to land and water affording good opportunities for recreation, fishing, and hunting.

Recreation impacts are discussed in more detail in Section III, Impacts of the Plan, of this Part.

Annual Equivalent

Investment	1,545	1,425	447	2,753
OM&R	2,473	2,070	810	4,167
Total	4,018	3,495	1,257	6,920

OM&R at 2000	3,959	3,560	1,128	6,742
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* Totals are nonadditive. Entire benefits and costs attributable to projects that cross State lines are included in summaries for both States involved.

Allocation of Costs

All costs are allocated to recreation.

SALINITY AND SEDIMENT CONTROL

Neither salinity nor sediment are major problems in the Apalachicola-Chattahoochee-Flint basins and no programs or projects are proposed exclusively for their control. There are a few local areas where erosion and sediment movement are severe. These and other areas would receive some sediment control benefits as a result of the soil conservation, forestry, upstream watershed, and recreation programs but the benefits have not been evaluated separately. In a few cases, such as Providence Canyon recrea-

tion development, control of erosion would be an objective as part of a program to maintain the scenic attraction of the area. The dollar value of preventing sediment movement into downstream reservoirs has not, however, been established. These benefits are relatively small in individual cases but in the aggregate for the entire basins area they amount to a significant but unevaluated bonus from the developments included in the general plan.

POLLUTION ABATEMENT AND PUBLIC HEALTH

Location

The pollution abatement and public health programs would be basinwide. A portion of the total program is included in multiple-purpose projects and is excluded from the cost and benefit figures shown in this portion of Section V.

Plan

The program for pollution abatement consists of new and extended sewerage systems and new and enlarged municipal and industrial waste-treatment facilities.

The public health program includes drainage and spraying measures for vector control, collection and disposal of solid waste for fly and rodent control, and air pollution and radiation monitoring.

Data

Pollution Abatement

Municipal sewerage systems	113
Primary plants	23
Secondary plants	90

Public Health

Solid-waste collection and disposal	
Number of sanitary landfill operations	87
Number of incinerators	6
Acres of landfill	3,166
Vector control	Basinwide
Air pollution and radiation monitoring	Basinwide

Benefits

Annual Equivalent Primary Tangible

Justification is based largely on intangible benefits.

Impacts

The Nation and its communities, as well as business and private operations and individuals, incur losses or damages because of water pollution. The larger share of the total damages is not directly accounted for. The impairment to health, the loss or diminution of fishing and recreational uses, and depreciated property values caused by polluted waters have an adverse economic impact that is diffused throughout society. This reduces the utility of the water resources and restricts economic growth rather than causing a direct dollar loss for corrective devices. These indirect consequences of pollution are not readily expressed in dollar terms because they are diffused and are not recorded by direct, open-market transactions. Nevertheless, such adverse consequences are real and constitute a handicap to the fulfillment of economic and social goods.

Vector control will not only guard against the spread of vector-borne diseases but also, as in the case of mosquitoes and other swarming and biting insects, it will reduce the mental and physical discomforts caused by these pests. Insect pest control deserves high priority in recreation planning. One vector problem that appears to be on the rise in areas along the eastern seaboard and could be significant in the basins in 1975 and 2000 is mosquito-borne encephalitis. At present, the only feasible approach to the control of encephalitis is a program of prevention through mosquito control.

Improper solid-waste handling breeds flies and rodents which cause diarrhea, dysentery, typhus,

and other less common diseases. Good sanitation practices, such as proper storage and collection and disposal of wastes, help control these diseases. Improper disposal also breeds mosquitoes and creates odor nuisances. Open dumps burn and become nuisances and air pollution problems. The proper storage, collection, and disposal of solid wastes will prevent such nuisances and benefit the community. The measures for solid-waste collection and disposal will also have effects far beyond these important public health aspects. By helping to prevent haphazard or uncontrolled wastes dumping and burning which spoils the countryside, these measures would add to well-being and help sustain the desirability

of the area. In addition, the land created by the fill generally has a value in excess of the original land involved.

Pollution abatement and public health impacts are discussed in more detail in Section III, Impacts of the Plan, of this Part.

Costs

Except for incinerator installations, the investment in the land and equipment required for collection and disposal of solid wastes and landfill operation costs are accounted for only in annual equivalent costs. Annual costs shown are those considered necessary to carry out effective basinwide programs.

Investment (\$1,000)

	Georgia	Florida	Alabama	Total
Early action				
Pollution abatement				
Municipal	124,600	2,700	10,600	137,900
Industrial	8,000	300	1,200	9,500
Total	132,600	3,000	11,800	147,400
Public health*				
Solid waste (incinerators)	5,000	---	---	5,000
Total				
Pollution abatement				
Municipal	295,500	5,500	18,200	319,200
Special	64,500	---	---	64,500
Industrial	9,800	500	1,200	11,500
Total	369,800	6,000	19,400	395,200
Public health*				
Solid waste (incinerators)	9,150	0	250	9,400

Annual Equivalent (\$1,000)

Pollution abatement				
Investment				
Municipal	6,825	135	460	7,420
Special	1,950	---	---	1,950
Industrial	275	15	40	330
Subtotal	9,050	150	500	9,700
Operation, maintenance, and replacements				
Municipal	1,900	30	110	2,040
Special	190	---	---	190
Industrial	60	0	10	70
Subtotal	2,150	30	120	2,300
Total	11,200	180	620	12,000
Public health				
Investment				
Solid waste	225	0	5	230
Operation, maintenance, and replacements				
Solid waste	4,180	80	340	4,600
Vector control	250	30	80	360
Air pollution and radiation monitoring	20	10	10	40
Subtotal	4,450	120	430	5,000
Total	4,675	120	435	5,230

	Georgia	Florida	Alabama	Total
Operation, Maintenance, and Replacements at Year 2000 (\$1,000)				
Pollution abatement				
Municipal	3,150	85	185	3,420
Special	240	—	—	240
Industrial	110	15	15	140
Total	3,500	100	200	3,800
Public health				
Solid waste	6,620	120	540	7,280
Vector control	250	40	80	370
Air pollution and radiation monitoring	30	10	10	50
Total	6,900	170	630	7,700

* No investment cost in public health program except for installation of incinerators.

Allocation of Costs

All costs are allocated to pollution abatement and public health.

BEACH EROSION CONTROL AND HURRICANE PROTECTION

Location

The coastal areas of the basins include more than 60 miles of mainland and barrier-island shoreline extending westward from St. George Sound to the end of St. Joseph Spit, Florida.

Plan

A cooperative survey should be made to determine needs and develop solutions for these problems. The survey would consider influences of tides, offshore currents, hazards from hurricanes, winds, and places of immediate danger. The results of Corps of Engineers studies, which cover most of the hurricane protection problems in the study area, should be utilized.

The Weather Bureau is responsible for furnishing advance warning when a hurricane is approaching and is likely to reach a coastal area. The Weather Bureau also provides information on conditions expected to occur within the hurricane, such as wind speeds, abnormal hurricane tides, probability and extent of flood-

ing, and other pertinent data about the storm.

Evacuation routes should be established over roads, bridges, and causeways. A community hurricane preparedness plan should be prepared by local authorities in cities and communities *along the Gulf coast to minimize death and destruction.*

Provisions should be made and adopted for establishing and enforcing zoning and building codes, establishing auxiliary power supplies and alternative communication systems, and constructing protective seawalls or similar structures.

An official State agency in Florida for shore preservation has been established with necessary provisions for State participation in erosion studies and in construction of protective works. This State agency should be fully utilized.

The beach erosion plans developed should be coordinated with plans for channel improvement and maintenance, hurricane protection, recreation, fish and wildlife proposals, and other improvements proposed for the area.

SECTION VI – OTHER PROJECTS CONSIDERED

The studies leading to the comprehensive plan for the Apalachicola-Chattahoochee-Flint basins involved consideration of numerous projects not included in the plan and various alternative locations and sizes for the projects that

were included. The more significant items eliminated during plan formulation, and brief reasons for their rejection, are shown in the summary that follows. More discussion on alternatives is contained in Appendix 12, Planning.

Name of project not included in plan	Key number on Fig. 4.20	Approximate location	Description	Purpose ¹	Reason for not including in plan
Irwins Bridge	1	7.5 miles E. of Cleveland, Ga.	Dam and reservoir	P, R, F&W	Infeasible under present conditions
Crow Bridge	21	8 miles E. of Cleveland, Ga.	Dam and reservoir	P, R, F&W	Irwins Bridge better alternative
Sautee	21	8 miles NE. of Cleveland, Ga.	Dam and reservoir	P, R, F&W	Irwins Bridge better alternative
Mud Creek	2	9 miles W. of Cornelia, Ga.	Dam and reservoir	P, R, F&W	Infeasible under present conditions
Mossy Creek	32	8 miles W. of Cornelia, Ga.	Dam and reservoir	P, R, F&W	Mud Creek better alternative
Bull Shoals	32	10 miles W. of Cornelia, Ga.	Dam and reservoir	P, R, F&W	Mud Creek better alternative
New Bridge	3	6 miles S. of Dahlonega, Ga.	Dam and reservoir	P, R, F&W	Infeasible under present conditions
Tesnatee	43	6 miles NE. of Dahlonega, Ga.	Dam and reservoir	P, R, F&W	Not economically justified
Yahooola Creek	43	2 miles S. of Dahlonega, Ga.	Dam and reservoir	P, R, F&W	New Bridge better alternative
Dahlonega	43	3.5 miles S. of Dahlonega, Ga.	Dam and reservoir	P, R, F&W	New Bridge better alternative
Vinings	4	Near Atlanta	Dam and reservoir	P, R, F&W	Infeasible because of high cost of right-of-way
Anneewakee Creek pump storage	5	17 miles SW. of Atlanta	Dam and reservoir	P, R, F&W	Infeasible under present conditions
Dog River pump storage	6	25 miles SW. of Atlanta	Dam and reservoir	P, R, F&W	Infeasible under present conditions
Miona	15	7 miles N. of Oglethorpe, Ga.	Dam and reservoir	P, R, F&W	Infeasible under present conditions
Sweetwater Creek	17	Near Andersonville, Ga.	Dam and reservoir	PA, R	Not physically feasible
Mountain Creek	18	14 miles E. of Americus, Ga.	Dam and reservoir	P, R, F&W	Infeasible under present conditions
Gum Creek	20	At Cordele, Ga.	Dam and reservoir	PA, R	Not physically feasible
Albany	21	At Albany, Ga.	Dam and reservoir	N, P, R	Not economically justified
Abrams Creek	22	8 miles NE. of Albany, Ga.	Dam and reservoir	P, R, F&W	Not economically justified
Flint-Ocmulgee	522	Vicinity of Vienna, Ga.	Canal and locks for inland navigation tie between Atlantic Ocean and Gulf of Mexico	N	High cost and lack of water for lockages
Columbia	25	Columbia, Ala.	Dock facilities and industrial site development	N	Not economically justified under present conditions
Look and Tremble Shoals	26	18 miles S. of Marianna, Fla.	Dam and reservoir	P, R, F&W	Not economically justified
Savannah-Chattahoochee-Coosa-Tennessee	6	North Georgia, Alabama and Tennessee	Boat channel, using streams, dams, locks, and canals, to provide tie from inland navigation system to Atlantic Ocean and Gulf of Mexico	N	Not economically justified

NOTES: ¹ F&W—Fish and wildlife; P—Hydroelectric power and industrial development; PA—Pollution abatement; R—Recreation; N—Navigation

² Located in vicinity of Irwins Bridge site.

³ Located in vicinity of Mud Creek site.

⁴ Located in vicinity of New Bridge site.

⁵ Located in general area of Abrams Creek site.

⁶ No specific location established.

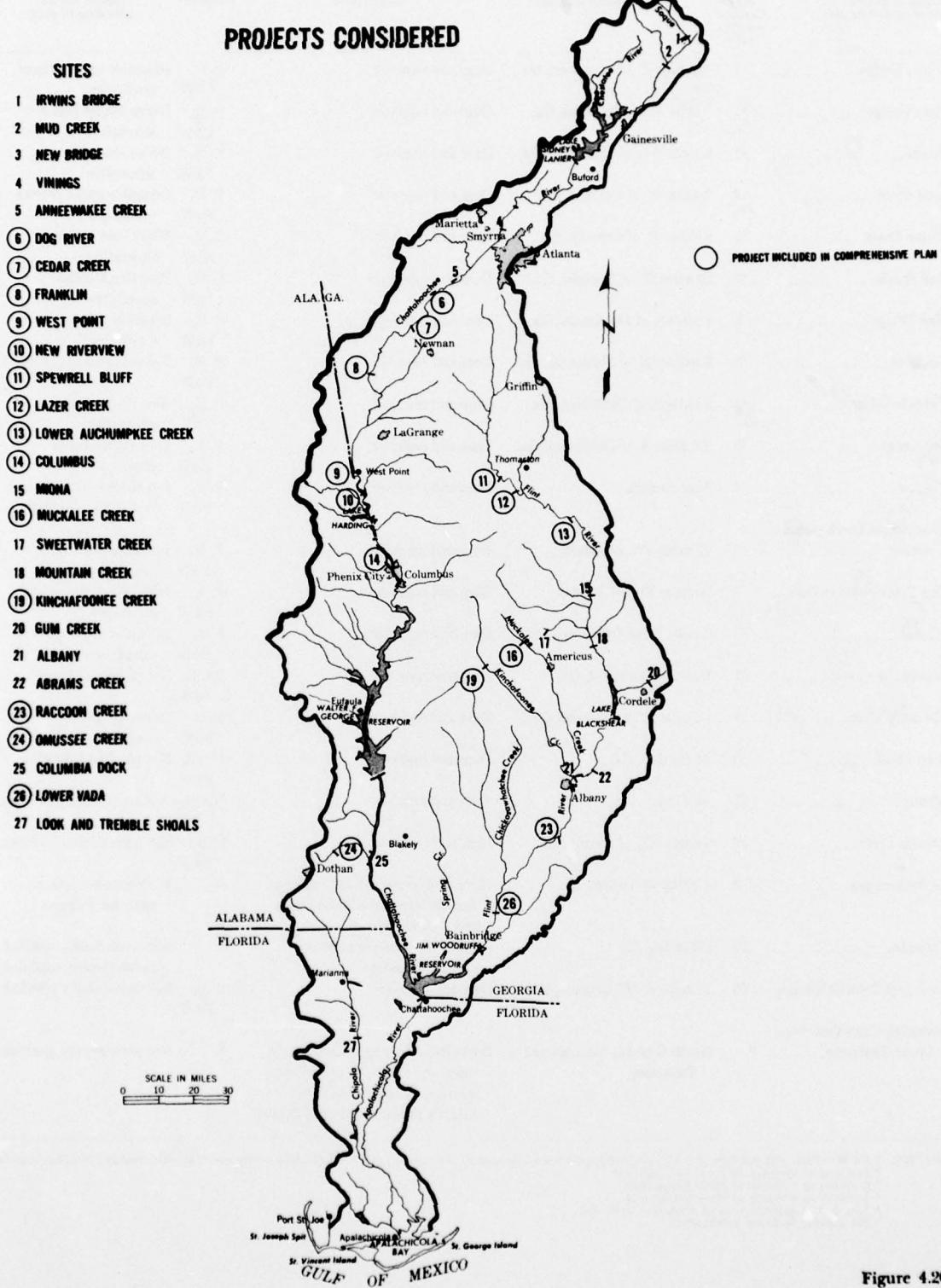


Figure 4.20

PART FIVE – CONCLUSIONS

DISCUSSION

The Apalachicola-Chattahoochee-Flint basins area has the potential for continued population and personal income growth through the year 2000. The projected rate of growth in both categories exceeds that of the Nation. The Apalachicola-Chattahoochee-Flint basins will also show greater population gains than the average for the Southeast River Basins. Gains in personal income are expected to be slightly less than the average for the Southeast River Basins, primarily because income levels in 1960 were considerably above the average. Realization of the projected levels of income depends upon a continuing rise in the productivity of the area workers as well as a large increase in the numbers employed. Urbanization, a trend well established, will be a major influence on future use of land and water resources in all parts of the Southeast and will be particularly significant in the Apalachicola-Chattahoochee-Flint basins because of the influence of the major metropolitan areas of Atlanta, Columbus-Phenix City, and Albany. With the shift toward an urban economy, which is part of a national trend, will come readjustments in urban-rural relations and influences. There will be increased emphasis on industrial development and problems connected with urbanization and for the rural economy increased emphasis on efficiency of rural enterprises. Thus, it is important to recognize that raising educational levels of the labor force and other institutional adjustments are needed to promote increased productivity and to permit desirable shifts to envisioned employment opportunities.

The comprehensive plan for the conservation and development of the area land and water resources, presented in Part Four, recognizes the rights and major responsibilities of the States and local interests in the development of the basins land and water resources. It provides

that the major portion of the new resource development programs and facilities be initiated, developed, and maintained by non-Federal entities.

The plan is designed to provide a framework for meeting projected needs to the year 2000 through efficient development and utilization of the area land and water resources. To be effective, the plan must be implemented as a joint local, State, and Federal effort by completion of actual programs and projects. In most instances, more detailed analyses and evaluations will be necessary before programs and projects are started. Because the plan is based on long-range assumptions and projections, it will need frequent reviews and periodic revisions to insure that it is properly responsive to changing times and conditions.

Apalachicola-Chattahoochee-Flint basins lands, with presently known management and technical knowledge factors, can produce food and fiber at several times the present rate and are more than adequate to meet their projected share of local, national, and world requirements for the year 2000. Losses by erosion and soil deterioration are serious in certain parts of the basins, and steps need to be taken to conserve for future generations the basic soil and water resources. The nonagricultural requirements for land will cause no serious restriction on agricultural production, and there is adequate land for the projected growth of urban areas with the accompanying industrial and service activities. Water, generally, is distributed favorably in relation to development possibilities and seasonal demands. If properly developed, sufficient water is available to meet all foreseeable requirements for human comfort and health and for needed expansion of industry, recreation, agriculture and forestry, and for fish and wildlife.

CONCLUSIONS

The Commission concludes:

(1) Flood damages are locally significant on the Chattahoochee, Flint, and Apalachicola Rivers and on some tributary streams but are not generally a major problem. Projects and programs in the comprehensive plan would alleviate the major flood problems existing or likely to develop in the more critical areas. Flood problems can be kept from arising in many other areas by proper flood plain management.

(2) There are no major water supply deficiencies in the area as a whole. Substantial quantities of ground water are available in the Coastal Plain. In the Piedmont and Blue Ridge provinces, where subsurface formations with little capacity for ground water storage limit the ground water supply, there are numerous opportunities for storage of surface runoff. Metropolitan Atlanta and a few other cities in the basins will need to arrange for additional surface water supplies before the year 2000; this is especially true for that part of the metropolitan area located beyond the physical limits of the Chattahoochee River basin. Water quality is generally suitable for most uses, and waters are amenable to treatment for the other uses.

(3) Navigation traffic on intracoastal and inland waterways is important to the area economy. Inland waterway extensions to Albany and Atlanta warrant careful consideration in the future, in the light of changing technology and increasing efficiencies, not only of water transportation but also of alternative modes of bulk shipment. It now appears that extension of barge and small-boat navigation to Albany and Atlanta will be justified in 15 to 40 years.

(4) Projected requirements for food and fiber can be met through a continuation and acceleration of current practices and programs and with some land-use changes. Individual operators are expected to install drainage and irrigation facilities for efficiency, increased yields, and improved uniformity in agricultural products. Marginal lands now in crop production would then be put in pastureland, woodland, or other uses.

(5) The hydroelectric power development proposals included in the plan, although significant, would fall far short of meeting the area demand for electric power. The proposed plants

will be used primarily for peaking. Projects on the upper Flint River that involve large hydroelectric power developments could be constructed by the Federal Government or by private power companies, or the dams could be constructed as Federal developments and the power facilities could be provided by the private companies that will distribute the power. The possibilities for operation of the projects are also flexible. The entire system could be operated by the Federal Government, by the power companies, or jointly. The decision on the best course to follow can be made when appropriation requests are made to Congress. Under any plan of procedure, the multiple-purpose aspects of the developments should be recognized, and some Federal financial participation will be required. The uses to be made of the projects in the system should be identical, irrespective of who builds or operates them. Possibilities that exist for development of pump storage projects alone and in combination with conventional installations may be an important adjunct to the hydroelectric supply in future years. Remaining sites with good long-range potential for hydroelectric power developments may be preempted for other uses unless steps are soon taken to reserve them.

(6) Industrial expansion is a key factor in supporting the projected income growth in the area. The levels of industrial growth reflected by projections are practicable of attainment with a concerted effort by community leaders to establish a suitable legal, institutional, social, and political environment with conditions favorable for financing, education, and training.

(7) Conservation treatment has been applied to most of the cropland, pastureland, and range-land of the area. However, soil erosion remains a problem. The application of erosion control and other conservation treatment measures would conserve soil and water resources and contribute to increased efficiency in production.

(8) Annual merchantable wood growth now exceeds the annual harvest and mortality, but projected levels of production can be met by the year 2000 if accelerated protective management programs are carried out.

(9) The proposed wildlife and sport fisheries

developments can meet the needs for hunting and fishing opportunity. More intensive management of existing habitat and development of new management areas at strategic locations are key items in the plan.

(10) Despite the natural productivity of the Gulf of Mexico, it will become increasingly difficult to harvest wild fish crops at costs permitting commercial fishing industries to compete with imports and the mass production and marketing methods of other food industries. The plan includes new programs for producing certain fishes for food and industrial purposes in Apalachicola Bay and other areas where the environment can be regulated.

(11) Demands for outdoor recreation are rapidly exceeding the capacity of developed facilities in the area, particularly in the vicinity of major urban centers and adjacent to the principal transportation routes. Plans for the Apalachicola-Chattahoochee-Flint and other basins in the study area provide for meeting all needs, but many Apalachicola-Chattahoochee-Flint basins residents will be required to seek recreation outside of the basins.

(12) Soil salinity is generally not a problem in the basins. Salt-water intrusion of fresh-water aquifers is not now a problem in the basins, and potential future problems can be obviated by judicious withdrawals, by shifts to alternative sources, or by a combination of these measures. Sedimentation problems are generally not serious, but erosion is critical in some local areas. Satisfactory sediment control can be achieved largely through conservation practices.

(13) Waste water from some sources is adequately treated, but much raw or inadequately treated sewage and industrial waste is still discharged directly into streams and lakes. As population grows and industry expands, the pollution problems will intensify unless adequate waste treatment can be provided and waste loadings reduced to assure stream water quality suitable for reuse. The population and industrial concentrations in the Apalachicola-Chattahoochee-Flint basins make the pollution abatement problem unusually difficult to cope with.

(14) Beach erosion and hurricane damage are problems in coastal reaches. Additional studies are required to evaluate these problems and to find solutions.

(15) The non-Federal costs of plan implementation, operation, maintenance, and replacements are within the financial capabilities of the basins, but some outside assistance in financing may be required. More-than-normal Federal assistance is suggested for the Cedar Creek-Anneewakee recreation and fish and wildlife complex to determine and demonstrate how non-Federal costs can be financed or repaid from project returns.

(16) In the course of implementing the comprehensive plan and keeping it responsive to changing conditions, recognition should be given to the existing water laws in relation to the development contemplated in the plan. The riparian doctrine is the basis for current water laws throughout the study area. The doctrine has been variously interpreted by legislative action and court decision reflecting, among other things, the reasonable use concept. Conflicts over surface and ground water use have not been widespread in the past because of the relative abundance of water. As water uses increase, there will be more competition for the available supplies. Optimum water development will sometimes require the storage of surplus flows for use at points considerable distances from the site in which the flows are stored. Some agreement among the interested groups—local, State, and Federal—will be needed to insure that the distribution of stored water will conform to the planned uses. It appears that this arrangement can be made within the framework of the existing water laws, but continuing consideration should be given to changes in the State water laws which ultimately may be desired.

(17) Personal income in the basins metropolitan areas is higher than that for most areas of the Southeast resulting in a higher-than-average per capita income for the basins as a whole. This relation is expected to continue, and by the year 2000 per capita income for the basins should be approaching national averages. The land and water resource developments needed to support the areas growth can be financed within the limits of available income without increasing the portion now being devoted to such purposes.

(18) Activities in all parts of the basins are rather closely related to the existence, development, and use of the Chattahoochee, Flint, and Apalachicola Rivers. Thus, seemingly local de-

velopments are in reality of interest to many areas, and there is a real and continuing need for areawide planning and for coordination of local planning.

(19) Much of the plan is based on reconnaissance-type information. The plan will have to be reviewed and refined, either on a continuing or periodic basis, if it is to be kept abreast of changing conditions and information and thus serve its intended purpose. Lack of topographic, geologic, economic, and other basic data is a handicap to resource-use planning in the area.

(20) Resource developments needed to support the basins economy at satisfactory levels are well within the limits of the physical, economic, and institutional abilities of the basins and their people. The projects and programs described in Part Four provide a basic, comprehensive, and integrated plan of development of the land and water resources of the basins. Their development, with the adjustments and revisions growing out of more detailed studies, should assist greatly in obtaining optimum public benefits from use of the areas resources.

PART SIX – LOCAL, STATE, AND FEDERAL PARTICIPATION AND ASSISTANCE

Acknowledgments

The U. S. Study Commission, Southeast River Basins, gratefully acknowledges the assistance and cooperation of the following:

Alabama

Department of Agriculture; Auburn University; Department of Conservation; State Docks Department; Extension Service; Division of Forestry; Geological Survey; Department of Public Health; Highway Department; State Planning and Industrial Development Board; Department of Labor; Pilotage Commission; Public Service Commission; River Development Board; Soil Conservation Committee; Soil Conservation Districts; and Water Improvement Commission.

Florida

Department of Agriculture; Board of Conservation; Development Commission; Extension Service; Florida State University; University of Florida; Forest Service; Game and Fresh Water Fish Commission; State Board of Health; Industrial Commission; Inland Navigation District; Board of State Parks and Historical Monuments; Railroad and Public Utilities Commission; Road Department; Soil Conservation Board; Soil Conservation Districts; and Suwannee River Water Conservation Authority.

Georgia

Department of Agriculture; Bainbridge Port Authority; Brunswick Port Authority; Extension Service; Forestry Commission; Game and Fish Commission; University of Georgia; Georgia Institute of Technology; Georgia State College; Georgia Southern College; Department of Public Health; Highway Department; Department of Industry and Trade; Jekyll Island State Park Authority; Department of Labor; Department of Mines, Mining, and Geology; Department of State Parks; Georgia Ports Authority; Public Service Commission; Savannah District Authority; Soil and Water Conservation Committee; Soil and Water Conservation Districts; Tide-

water Commission; Waterways Commission; Water Quality Council; and Water Resources Commission.

North Carolina

Extension Service; State Board of Conservation and Development; Highway Department; North Carolina State College; Western North Carolina Regional Planning Commission; Soil Conservation Committee; Department of Water Resources; Soil Conservation Districts; and Wildlife Resources Commission.

South Carolina

Department of Agriculture; Clemson College; Development Board; Extension Service; Forestry Commission; State Board of Health; Department of Labor; Congaree Navigational Study Committee; Parks Commission; Ports Authority; Public Service Authority; Public Service Commission; Soil Conservation Committee; Committee for Water Development; Soil Conservation Districts; Water Pollution Control Authority; and Wildlife Resources Department.

General

Altamaha Development Association; Middle Chattahoochee Development Association; Upper Chattahoochee Development Association; Choctawhatchee-Pea Development Association; Council of State Governments; Southern Regional Education Board; Southeastern Power Committee of Electric Membership Cooperatives of Nine Southeastern States; and Three Rivers Development Association.

Federal

U. S. Department of Agriculture—Agricultural Marketing Service, Agricultural Research Service, Agricultural Stabilization and Conservation Service, Economic Research Service, Farmers Home Administration, Forest Service, and Soil Conservation Service; U. S. Department of the Army—Beach Erosion Board, Board of Engineers for Rivers and Harbors, Corps of Engineers, and Military Posts; Atomic Energy Commission;

Atlanta Federal Reserve Bank; U. S. Civil Service Commission; U. S. Department of Commerce—Area Redevelopment Administration, Business and Defense Services Administration, Bureau of the Census, Office of Business Economics, Bureau of Public Roads, Small Business Administration, and Weather Bureau; Federal Power Commission; General Services Administration; U. S. Department of Health, Education, and Welfare—Public Health Service; Housing and Home Finance Agency; U. S. Department of the Interior—Bureau of Commercial Fisheries, Geological Survey, Bureau of Mines, National Park Service, Bureau of Reclamation, Bureau of Outdoor Recreation, Southeastern Power Administration, and Bureau of Sport Fisheries and Wildlife; U. S. Department of Labor—Bureau of Labor Statistics; U. S. Department of the Navy—Sixth Marine Corps Reserve and Recruitment District; Executive Office of the President—Bureau of the Budget, and Public Works Planning; Outdoor Recreation Resources Review Commission; Advisory Commission on Intergovernmental Relations; Select Committee on National Water Resources, U. S. Senate, 86th Congress; Smithsonian Institution; U. S. Study Commission—Texas; and Tennessee Valley Authority.

In addition, the Commission gratefully acknowledges assistance received from numerous county and municipal governments, planning commissions, development commissions, chambers of commerce, corporations, trade associations, interested individuals, press, radio, television, and professional societies.

Public Hearings and Presentations

A series of public hearings were held early in the investigation to secure the views and desires of various interests, organizations, and individuals. These hearings were held at Tallahassee, Florida, on November 16, 1959; at Dothan, Alabama, on November 17, 1959; at Macon, Georgia, on November 18, 1959; and at Anderson, South Carolina, on November 19, 1959.

During the latter stage of the studies, a series of public presentations were held to acquaint the public with the proposed plan of the Commission for development of the land and water resources of the Southeast River Basins; to inform Federal, State, local, and private interests

of their responsibility in implementing the developments proposed; and to solicit views and opinions on the proposals under active consideration. These presentations were held as follows:

Place	Date
Statesboro, Georgia	March 20, 1962
Waycross, Georgia	March 23, 1962
Tallahassee, Florida	May 15, 1962
White Springs, Florida	May 17, 1962
Valdosta, Georgia	May 18, 1962
Geneva, Alabama	June 19, 1962
Pensacola, Florida	June 20, 1962
Savannah, Georgia	July 16, 1962
Clemson, South Carolina	July 17, 1962
Atlanta, Georgia	August 13, 1962
Columbus, Georgia	August 14, 1962
Albany, Georgia	August 14, 1962
Baxley, Georgia	August 15, 1962
Macon, Georgia	August 16, 1962
Athens, Georgia	August 17, 1962

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